Corkey Windfarm Repowering

Environmental Statement

Volume 1 - Text
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SCOTTISHPOWER RENEWABLES

Environmental Statement Volume 1: Preface

1. This document comprises the Environmental Statement (ES) and its Non-Technical Summary prepared in support of an application for consent under The Planning Act (Northern Ireland) 2011 for the Repowering of the Operational Corkey Windfarm (the 'Development').

2. The Operational Corkey Windfarm is located approximately 18 kilometres (km) north of Ballymena in County Antrim, within the Causeway Coast and Glens Borough Council (CCGBC) administrative area, and consists of ten Nordtank 500 kilowatt (kW) wind turbines, which can produce up to a total of five megawatts (5 MW) of clean renewable energy. The repowering of the Operational Corkey Windfarm involves the removal of the existing ten wind turbines from the Site and replacing them with five new and more efficient turbines together with the associated ancillary infrastructure.

3. The Site is located on the western periphery of the Antrim Hills with the low-lying valley of the River Main to the west and the broader range of the Antrim Hills to the east. The Site is characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan and its moorland land cover. The predominant land use, in conjunction with the Operational Windfarm is agricultural. The approximate National Grid Reference is NX309422.

4. The Environmental Statement (ES) comprises the following documents:

- A Non-Technical Summary;
- The main report (this principal document) and supporting figures; and
- A Technical Appendix.

5. In addition to the above, the application includes a Planning Statement, Design and Access Statement, Residential Visual Amenity Assessment and Pre-Application Consultation Report which are submitted in support of the application but which does not form part of the ES.

6. Further copies of the ES and or further information on the Development may be obtained from:

ScottishPower Renewables
ScottishPower House
320 St Vincent Street
Glasgow
G2 5AD
Tel: +44(141) 614 0000

7. A copy of the ES with its Technical Appendices is available in print; printing will be charged at cost price. In addition, all documents are available (as PDF) on CD/DVD for £20.00. Copies of the Planning Statement, Design and Access Statement and Non-Technical Summary are available free of charge.

8. The ES Volumes, NTS and supporting documents are available to view online at:

- https://www.scottishpowerrenewables.com/pages/corkey_repowering.aspx

9. The public can view the ES during normal office hours at Causeway Coast and Glen Borough Council Coleraine Office, 66 Portstewart Road, Coleraine, BT52 1EY.

10. The ES is also available for viewing by the public during normal opening hours at the following location:

- Loughgiel Millennium Centre, 38 Lough Road, Loughgiel, Ballymena, BT44 9JN.

11. Comments on the application for consent should be forwarded to the address below:

Causeway Coast and Glen Borough Council Coleraine Office
66 Portstewart Road
Coleraine
BT52 1EY.

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1 Introduction

1.1 Introduction

1. This Chapter of the Environmental Statement (ES) introduces the Repowering of the Operational Corkey Windfarm (the Development), and provides details of the Environmental Impact Assessment (EIA) project team and the structure of the ES. This chapter is supported by the following technical appendices:

- Technical Appendix A1.1: Author Qualifications.

2. The Operational Corkey Windfarm was developed and constructed by RES and B9 Energy Services in 1994, and then acquired by ScottishPower Renewables (the Applicant) who now own and operate the site. The Operational Corkey Windfarm is located approximately 18 kilometres (km) north of Ballymena in County Antrim, Northern Ireland and consists of ten Nordtank 500 kilowatt (kW) wind turbines, which can produce up to a total of five megawatts (5 MW) of clean renewable energy. To date, the Operational Corkey Windfarm has made an important contribution to Northern Ireland's Renewable Energy targets and low carbon objectives, and the Applicant is seeking to secure and build on this contribution by proposing to 'repower' the Operational Corkey Windfarm (The Development).

1.2 The Applicant

3. ScottishPower Renewables is part of the ScottishPower group of companies, operating in the UK under the Iberdrola Group, one of the world's largest integrated utility companies and a world leader in wind energy. ScottishPower now only produces 100% green electricity – focusing on wind energy, smart grids and driving the change to a cleaner, electric future. The company is investing £4m every working day in 2019 to make this happen and is committed to speeding up the transition to cleaner electric transport, improving air quality and over time, driving down bills to deliver a better future, quicker for everyone.

4. ScottishPower Renewables, is at the forefront of the development of the renewables industry through pioneering ideas, forward thinking and outstanding innovation. Its ambitious growth plans include the expansion of its existing onshore wind portfolio, investment in new large scale solar deployment and innovative grid storage systems. The company is also delivering the Iberdrola Group's offshore windfarms in the Southern North Sea off East Anglia as part of an international pipeline of projects across Europe and the USA.

5. With over 40 operational windfarms, all sites are managed through the world leading Control Centre at Whitelee Windfarm, located outside of Glasgow in Scotland.

6. The Applicant has a long-standing foundation in Northern Ireland and currently owns and operates five onshore windfarms which include Corkey, Rigged Hill, Callagheen, Elliots Hill and Wolf Bog Windfarms, together with Barnesmore Windfarm in the Republic of Ireland. Through their long-term presence in Northern Ireland, the Applicant has contributed over £200,000 of community benefits, contributing to an assortment of groups and organisations including donations made to and managed by the Fermanagh Trust and funding local primary schools. This has supported a range of projects, such as improving community centre accessibility, sponsoring local youth group activities and creating a sensory garden for a playgroup.

7. The development of its West of Duddon Sands Offshore Windfarm, in the Irish Sea (operational since 2014), enabled the construction of the c. £50 million bespoke facility at Belfast Harbour which began in early 2012, creating the first purpose built offshore wind installation and pre-assembly harbour in the UK and Ireland, supporting up to 300 jobs in the process.

8. Through the construction of East Anglia ONE Offshore Windfarm in the North Sea, Lamprell (in partnership with Harland and Wolff) in 2017, were also awarded a significant foundation contract. The value of this contract was c. £30 million, with an average labour force of 200 people across the duration of the project.

9. To date, the Applicant has experience of developing, constructing and operating repowered onshore windfarm projects throughout the UK, including Carland Cross Windfarm in Cornwall, Coal Clough Windfarm near Burnley, and the consented repowering project at Llandinam Windfarm in Wales.

10. As one of the UK's principal onshore wind developers, the Applicant seeks to maximise the local benefits that can be created in the communities where they operate and continue to be a good neighbour. To date, the Applicant has enabled communities surrounding onshore windfarms to deliver initiatives across the UK by contributing over £20 million in community benefits.

1.3 Purpose

11. Based on the site area, potential turbine capacity, and the known onsite environmental and technical constraints, the installed capacity of the Development is in the region of 20 MW, and therefore an application for planning permission is being made under the provisions of The Planning Act (Northern Ireland) 2011. As stated within the Scoping Opinion dated 28th February 2018 and contained within **Technical Appendix A2.2** this application requires an EIA under Schedule 2 of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (the EIA Regulations). The findings of the EIA have been presented within this ES which accompanies the planning application submitted to the Causeway Coast and Glens Borough Council (the Council).

12. Further description of the Development is presented in **Chapter 3: Development Description** and **Chapter 4: Site Selection and Layout Alternatives** of this ES.

13. This ES offers information on the identification and assessment of the likely significant environmental effects of the Development and has been undertaken in accordance with the EIA Regulations. Additional details on the legislative requirements for EIA are presented in **Chapter 2: EIA Methodology** of this ES.

1.4 Key Terms

14. To ensure clarity in the ES the following terms are used:

Table 1.1: Defined Terms Used Within the ES

Term	Definition
Repowering	This is the process of removal and replacement of older first generation wind turbines with modern machines, which are generally quieter, and capable of producing more electricity, more efficiently.
The Site	Refers to all land that falls within the Site Boundary.
The Site Boundary	Refers to the red line boundary at the time of Scoping.
Operational Corkey Windfarm	Refers to the existing Corkey Windfarm at the Site, which has been operational since 1994.
The Development	Refers to all elements of the application for the repowering of the Operational Corkey Windfarm the details of which will be set out within **Chapter 3: Development Description**. These elements include the wind turbines, all site infrastructure, access tracks, energy storage etc.
Survey Areas	Refers to areas within which surveys are undertaken. These are specifically defined within each technical section.
Study Areas	Refers to areas which are considered as part of the assessment process. These are specific and defined within each technical section.
Indicative Developable Area	Refers to an indicative area within the Site Boundary where turbines may be located. This does not apply to other ancillary site infrastructure or the energy storage element. This area was defined for Scoping purposes.
The Council	Refers to the Causeway Coast and Glens Borough Council.
The Applicant	Refers to ScottishPower Renewables.
EIA Regulations	Refers to The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.
Scoping / Scoping Opinion	This is the process to identify key environmental issues, and to determine which elements of the Development are likely to cause significant environmental impacts and to identify elements that can be removed from the assessment.
Energy Storage / Energy Storage Unit	Refers to the Energy Storage Element, Energy Storage is defined as the capture of energy produced at one time for use at a later time.

Term	Definition
The Onsite Substation and Control Building	Refers to the onsite substation and control building including the compound in which it is located.

1.5 Site and Setting

15. The Development is a repowering of the Operational Corkey Windfarm, situated approximately 18 km north of Ballymena, in County Antrim. Located on the western periphery of the Antrim Hills with the low lying valley of the River Main to the west and the border range of the Antrim Hills to the east. Elevations of the Site extend from approximately 160 metres (m) above ordnance datum (AOD) in the south-west to approximately 410 m AOD at the east of the Site.

16. The upper areas of the Site are predominately moorland cover and are characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan. The main land use, in conjunction with the Operational Corkey Windfarm, is agricultural. There are a number of small unnamed watercourses and man-made open field drains within the Site, most of which drain in a westerly direction although some drain northwards.

17. There are no public roads within the Site and the Operational Corkey Windfarm is currently accessed from Reservoir Road, located north-west of the Site. The historical land ownership pattern of this area is based on the land being divided into small plots. This has led to a dispersed settlement pattern, whereby individual dwellings occur frequently across the landscape, accessed by the network of rural roads. The wider site location is shown in **Figure 3.1**.

1.6 Overview of the Development

18. The Development is described in more detail in **Chapter 3: Development Description** of this ES and the layout is shown in **Figure 3.**2, and with the Operational Corkey Windfarm site layout underlain, shown in **Figure 3.3.**

19. In summary, the Development will comprise of the following phases:

- Decommissioning of Operational Corkey Windfarm (initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (final phase).

20. The Development will comprise of the following main components:

- Decommissioning of the existing 10 turbines, removal and reinstatement of the existing substation building and other redundant infrastructure;
- The erection of 5 three bladed horizontal axis wind turbines of up to 137 m tip height;
- Turbine foundations;
- Construction of approximately 1.955 km of new access tracks;
- Upgrade of approximately 2.095 km of existing access tracks;
- Construction of temporary and permanent hardstanding areas for each turbine to accommodate turbine component laydown areas, crane hardstanding areas and external transformers and/or switchgears;
- Temporary construction compound/laydown areas (some areas may be reinstated temporarily if required for future operational and decommissioning purposes);
- Turning heads and passing places incorporated within the site access infrastructure;
- New road junction with Reservoir Road;
- Three upgraded water crossings and five new water crossings;
- Meteorological Mast;
- Buried underground electrical and communication cables;
- Substation, with roof mounted solar panels, and associated compound, including windfarm and grid connection operating equipment;
- Energy storage units; and
- Associated ancillary works.

21. Micrositing allowance of 50m deviation from the indicative design footprint is presented in **Figure 3.2**

1.7 Need for the Development

1.7.1 Windfarm Repowering

22. The repowering of a windfarm involves the removal of existing wind turbines from a site and replacing them with new and more efficient turbines. This process normally results in an increased overall site generating capacity and output as well as generally reducing the total number of turbines within the Site.

23. Repowering a windfarm site supports an ongoing use of the land at Corkey (the Site) by a renewables asset, which is vital to Northern Ireland maintaining and building upon its renewable energy and climate change targets, as outlined in the Strategic Framework for Northern Ireland[1]. Repowering also presents an opportunity to sustain and create additional jobs and to encourage continued investment in the renewable energy industry in Northern Ireland. The repowering of a windfarm differs from that of developing a greenfield site as the area has previously been developed, has demonstrated its suitability for use as a windfarm site, and will continue to be used for the same activity. As a result, the consenting and EIA process can draw on any information already available for the site to assess effects.

24. As well as the inherent benefits of creating and expanding upon the existing mix of renewables in Northern Ireland's electricity system, repowering offers a number of major opportunities:

- Increased site generation;
- Reduces dependency on fossil fuels resulting in lower carbon dioxide (CO_2) emissions and output;
- Reduced number of turbines, utilising the latest turbine technology, sustaining and growing the level of renewable energy in Northern Ireland;
- Sustains existing development and construction jobs, and creates opportunities for new supply chain jobs;
- With a supportive planning framework, it can help create a long-term, stable investment platform for a clear pipeline of repowering projects, easing pressure on consenting authorities; and
- Utilises over two decades of industry knowledge to inform and improve the siting, design and construction techniques to create more efficient projects.

25. The Operational Corkey Windfarm is consented in perpetuity, and the repowering of the windfarm with more efficient machines will maximise the benefits of re-using an existing site whilst minimising new environmental effects. Operating for a longer period enables the Applicant to continue to drive down the overall cost of energy with benefits to the Northern Irish consumer, and provides opportunities to incorporate emerging technologies such as energy storage.

26. **Table 1.2** below provides a comparison between the Operational Corkey Windfarm and the Development.

27. The proposed repowering project has the potential to result in an increase in the installed capacity of the Site from 5 MW to around 20 MW, c. 4 times the existing installed capacity. The proposed larger generator size, coupled with greater wind yields from the use of taller turbines with bigger rotors, and the improved efficiency of the latest turbine models will result in a major increase to total power generated at the Site c. 4 times the power output of the existing site. Please refer to **Section 1.7.7** of this chapter which sets out the need for and benefits of Energy Storage.

Table 1.2 – Comparison of Operational Corkey Windfarm with the proposed Development.

Characteristic	Operational Corkey Windfarm	The Development
Number of Wind Turbines	10	5
Maximum Tip Height	57 m	137 m
Turbine Max Power	0.5 MW	C. 4MW
Overall Wind Farm Capacity	5 MW	C. 20 MW
Energy Storage	No	Yes

[1] Department for the Economy (2010) Strategic Framework for Northern Ireland. Available online at: https://www.economy-ni.gov.uk/publications/energy-strategic-framework-northern-ireland [Accessed on 31/10/2017]

1.7.2 International Energy Policy

28. International energy policy is based on a global imperative to combat climate change and reduce carbon dioxide (CO_2) emissions and, therefore, is relevant to renewable energy development.

29. The United Nations Framework Convention on Climate Change (UNFCCC)[2], implemented by the United Nations in May 1992, determined a long term objective to lessen greenhouse gases in the atmosphere, with the purpose of preventing anthropogenic interference with the climatic system. Subsequently, the Kyoto Protocol was implemented in 1997[3]. National governments who signed up to the Kyoto Protocol are committed to reducing their greenhouse gas emissions.

30. The Paris Agreement[4] marks the latest step in the development of the UN regime on climate change. Its central objective is to boost global response to climate change, keep global temperature rise low and strengthen efforts to support this. The European Union signed The United Kingdom of Great Britain and Northern Ireland up to the Agreement on 22nd April 2016 and it came into force on the 18th December 2016.

31. European and national energy policy has been established from the Kyoto Protocol and Paris Agreement requirements and will continue to be framed by emerging guidance and scientific information. For example, the IPCC 2018 report[5], "Global Warming of 1.5ºC", presents a summary for policymakers of the implications of predicted climate change, and potential actions that could limit future climate change, such as "reaching and sustaining net zero global anthropogenic CO_2 emissions".

1.7.3 European Energy Policy

32. The European Union's (EU) energy policies are set out and powered by three main objectives:

- To ensure all energy providers operate in a competitive environment that ensures affordable prices for homes, businesses, and industries;
- To secure energy supplies to ensure reliable energy delivery whenever and wherever it is needed; and
- To have sustainable energy consumption, through lowering dependence on fossil fuels and decreasing greenhouse gas emissions and pollution.

33. The EU produced the Renewable Energy Directive 2009/28/EC[6], revised in 2016, to make the EU a global leader in renewable energy and ensure that the target of the final energy consumption being at least 27% renewables is met by 2030.

34. Subsequently, in 2015, the EU set itself a long-term goal of reducing greenhouse gas emissions by 80-95%, when compared to 1990 levels, by 2050. The Energy Roadmap 2050[7] sets out the transition and cost effective pathways for key economic sectors for achieving an 80-95% reduction in EU emissions by 2050. To achieve this goal, significant investment is needed in new low-carbon technologies and infrastructure, energy efficiency and renewable energy.

35. The 2050 target will not be shifted into national targets via EU legislation, but allows more flexibility for Member Countries to meet their greenhouse gas emission reduction targets in the most cost effective method in regards to their own specific circumstances.

1.7.4 UK Energy Policy

36. The UK Renewable Energy Strategy[8] sets out to identify how the required growth in renewable energy use could be delivered. The objectives of the Strategy include clearing implementation barriers, increasing investment in emerging technologies and pursuing new sources of renewable energy supply and creating opportunities to harness renewable energy. The strategy supports the precedent to ensure the UK can deliver 30% renewable electricity by 2020.

37. The Overarching National Policy Statement for Energy (EN-1) and The National Policy Statement for Renewable Energy Infrastructure (EN-3) states that projections suggest that by 2020, 30% or more of the UK's electricity generation could come from renewable sources.

1.7.5 Northern Irish Energy Policy

38. In 2010, the Department for Enterprise, Trade and Investment (DETI) published the Strategic Energy Framework[9] (SEF) which details Northern Ireland's energy future over the next ten years, and sets out the renewable electricity targets for 2020 identifying that the equivalent of 40% of national electricity needs must be sourced from renewables.

39. The 2010 SEF recognises that electricity generation from onshore wind is the most established, large scale source of renewable energy in Northern Ireland. It is also the lowest cost land-based renewable energy available. Furthermore, it states that onshore windfarms will play a vital role in meeting the new 2020 renewable electricity target.

40. DETI produced a report in 2013 titled Envisioning the Future: Considering Energy in Northern Ireland[10] to 2050 which details a vision for energy supply in Northern Ireland up to 2050. The Vision builds on the SEF and determines what can be achieved by 2050 and what early decision need to made to support the 2050 vision. The scenarios produced in the report envisage that greenhouse gas emissions will be reduced by 55% to 80% by 2050 and that Northern Ireland will become a net exporter of energy.

41. Additionally, the Northern Ireland Investment Strategy 2011-2021[11] underlines the importance of renewable sources in electricity generation. It focuses on long-term targets, emphasising that the UK Climate Change Act 2008 legislated for an 80% mandatory reduction in the UK's carbon emissions by 2050 (compared to 1990 baseline levels), with an interim target of 35% by 2025.

42. For the 12 month period January 2018 to December 2018, 38.2% of total electricity consumption in Northern Ireland was generated from renewable sources located in Northern Ireland. This represents an increase of 3.5% on the previous 12 month period (January 2017 to December 2017) and is the highest rolling 12 month proportion on record. Additionally over the 12 month period January 2018 to December 2018, of all the renewable energy generated in Northern Ireland, 83.1% was generated from wind. This compares to 84.3% for the previous 12 month period (January 2017 to December 2017)[12].

43. The Onshore Renewable Energy Action Plan (OREAP) 2013-2020[13] recognises the importance of the contribution of onshore renewable technologies to the 40% renewable energy target by 2020. It considers the impact onshore wind has on the energy network in Northern Ireland, referring to the requirement for grid infrastructure upgrades prior to transmission reinforcement, and noting that this is required in order to achieve the 40% target. It also notes "*the need to increase the rate of deployment of renewables to achieve the 40% target at least cost to the consumer*". The Mid-Term Review of the OREAP[14] was published in 2017, and noted progress on actions set out in the OREAP, including towards the removal of grid constraints.

1.7.6 Repowering

44. In 2019, RenewableUK published a report[15] showing that older wind farms, which were built in 1990s, are now being decommissioned and that if they are not replaced then 8GW could be retired, which equates to 17.5% of the UK's renewable power output which is capable of powering 5 million homes.

[2] The United Nations Framework Convention on Climate Change (UNFCCC) (1992). Available online at: http://unfccc.int/resource/docs/convkp/conveng.pdf [Accessed 02/10/2017]
[3] The Kyoto Protocol (1997). Available online at: http://unfccc.int/resource/docs/convkp/kpeng.pdf [Accessed 02/10/2017]
[4] The Paris Agreement (2015). Available online at: https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf [Accessed 02/10/2017]
[5] IPCC (2018). Global Warming of 1.5ºC. Available at: https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf [accessed on 01/02/2019].
[6] The Renewable Energy Directive 2009/28/EC. Available online at: http://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32009L0028 [Accessed 02/10/2017]
[7] The EU 2050 Strategy. Available online at: https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2050-energy-strategy [Accessed 02/10/2017]
[8] The UK Renewable Energy Strategy (2009). Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf [Accessed 02/10/2017]
[9] Department of Enterprise, Trade and Investment (2010). Strategic Energy Framework. Available online at: https://www.economy-ni.gov.uk/publications/energy-strategic-framework-northern-ireland [Accessed on 12/10/2017]

[10] DETI (2013) Envisioning the Future: Considering Energy in Northern Ireland Available at https://www.nienvironmentlink.org/cmsfiles/policy-hub/files/documentation/Energy/2050_main_report_-_final_version.pdf [Accessed 09/05/2019]
[11] Northern Ireland Executive (2015). Investment Strategy for Northern Ireland 2011 – 2021. Available online at: https://www.infrastructure-ni.gov.uk/publications/investment-strategy-northern-ireland-2011-2021 [Accessed: 12/10/2017]
[12] Department for the Economy , March 2019, Electricity Consumption and Renewable Generation in Northern Ireland January 2018 to December 2018, Available online at: https://www.economy-ni.gov.uk/publications/electricity-consumption-and-renewable-generation-northern-ireland-january-2018-december-2018 [Accessed 15/5/19]
[13] Department of Enterprise, Trade and Investment (2013). Onshore Renewable Electricity Action Plan. Available online at: https://www.economy-ni.gov.uk/articles/onshore-renewable-electricity-action-plan [Accessed: 12/10/2017]
[14] Department of Enterprise, Trade and Investment (2017). Mid-Term Review of the Onshore Renewable Electricity Action Plan. Available online at: https://www.economy-ni.gov.uk/sites/default/files/publications/economy/Mid-term-Review-OREAP-Report.pdf [Accessed: 31/01/2019]
[15] RenewableUK (2019), Onshore Wind: The UK's Next Generation

45. The report states that these older turbines should be replaced by new turbines that are larger and more efficient, resulting in a reduced number of turbines overall. Under their optimum scenario, older turbines would be replaced or repowered by 12GW of new turbines, a net increase. However, under an intermediate scenario, where present approval trends continue, the capacity could be reduced by 2GW, or by 5.5GW under the lowest scenario considered.

46. Under these more pessimistic scenarios the UK would find it harder to meet its energy needs as well as its carbon reduction targets. This in turn emphasises the need for, and importance of repowering proposals in meeting Northern Ireland's future energy needs.

1.7.7 Energy Storage

47. The previous Northern Ireland Affairs Committee published its Third Report of Session 2016–17, Electricity Sector in Northern Ireland, on 1 May 2017 as House of Commons Paper HC 51, in which it stated that Northern Ireland is anticipated to fall into a deficiency of supply by 2021. The report goes on to state:

48. "*Electricity storage presents a particular opportunity for Northern Ireland, where these technologies could allow the market to take full advantage of the significant investment that has been made in renewable generation in recent years. The ability to store renewable energy—capturing excess electricity at times of high generation so that it can be used when the wind does not blow—has the potential to dramatically increase the contribution of renewables to the system, reduce costs for consumers through lower wholesale prices and constraint payments, and allow for the more efficient management of the electricity grid through better control of supply and demand and reduced congestion on the network*"[16].

49. Balancing the electricity grid to ensure demand is met by supply is a key requirement of Northern Ireland Electricity (NIE).

50. When unforeseen demand is put on the network, such as when a large power station suddenly comes offline, the energy storage element of the Development will provide a flexible and rapid release of electricity, which could in turn allow NIE to regulate electricity supply and demand without any greenhouse gas emissions. Conversely, it will also have the capacity to absorb electricity quickly which will allow for the oversupply power onto the grid to be managed.

1.8 Environmental Statement

51. This ES reports the findings of the assessment of the potential significant environmental effects of the Development during the initial decommissioning phase of the Operational Corkey Windfarm, and the construction and operational, and final decommissioning phases of the Development. This assessment forms part of the extensive process of the EIA, which is undertaken to ensure that the likely significant effects, both positive and negative, arising from the Development are considered in full by the decision maker prior to the determination of an application for development consent or planning permission.

52. The objectives of the ES are summarised as follows:

- To identify both positive and negative potential effects that may be significant, resulting from the decommissioning, construction and operation phases of the Development, taking into consideration the size and location, the sensitivity of the local environment, the requirements of statutory consultees and the concerns of interested parties;
- To establish the existing environmental conditions of the Site and surrounding area, where relevant to the likely significant effects;
- To predict the extent and assess the significance of the potential effects;
- To identify and evaluate possible mitigation measures to avoid, reduce or offset any negative, likely significant effects; and
- To identify and assess any residual effects.

53. The general methodology for the ES is detailed in **Chapter 2: EIA Methodology**.

1.9 EIA Project Team

54. This ES has been compiled by Arcus Consultancy Services Ltd (Arcus), an independent specialist in the production of EIAs on behalf of the Applicant. Arcus is a specialist renewable energy consultancy comprising over 60 staff with a proven track record of delivering windfarm EIA projects over the past 13 years. Many of Arcus' staff also have substantially longer experience of windfarm work, through roles with previous companies. To date, Arcus have submitted over 60 applications for renewable EIA developments.

55. Arcus had overall responsibility for the coordination of the EIA and the production of the ES with input from other independent specialist consultants where necessary. **Table 1.3** provides details of the authors and contributors of each aspect of the ES. Further details on the qualifications of each member of staff can be found in **Technical Appendix A1.1**.

Table 1.3: EIA Project Team

ES Chapter		Organisation
Chapters 1 - 4	Introductory ES Chapters	Arcus Consultancy Services Ltd.
Chapter 5	Planning Policy Context	Juno Planning & Environmental Ltd
Chapter 6	Landscape and Visual Amenity	Optimised Environments Ltd (OPEN)
Chapter 7	Hydrology, Hydrogeology, Geology, Soils and Peat	Arcus Consultancy Services Ltd
Chapter 8	Ecology and Fisheries	NM Ecology and Paul Johnston Associates
Chapter 9	Ornithology	Bird Surveyors Ltd
Chapter 10	Noise	Arcus Consultancy Services Ltd
Chapter 11	Archaeology and Cultural Heritage	Arcus Consultancy Services Ltd
Chapter 12	Access, Transport and Traffic	Arcus Consultancy Services Ltd
Chapter 13	Tourism, Recreation and Socio-Economics	Arcus Consultancy Services Ltd
Chapter 14	Other Issues and Interrelationships	Arcus Consultancy Services Ltd and ScottishPower Renewables.
Chapter 15	Summary of Mitigation	Arcus Consultancy Services Ltd

1.10 Glossary of Common Acronyms

The common acronyms used throughout this ES are contained in **Table 1.4** below.

Table 1.4 Common Acronyms

Acronym	Term
AAR	Average Annual Rainfall
ADT	Average Daily Traffic
AGL	Above Ground Level
AHSV	Area of High Scenic Value
ALRA	Abnormal Load Route Assessment
ALV	Abnormal Load Vehicle
AM	Amplitude Modulation
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASSI	Area of Special Scientific Interest
ATC	Automatic Traffic Count
BCT	Bat Conservation Trust
BPG	The Best Practice Guide
CCGBC	Causeway Coast and Glens Borough Council

[16] Third Report of Session 2016–17, Electricity sector in Northern Ireland, 1 May 2017, House of Commons Paper HC 51, Accessed 15/1/19, https://publications.parliament.uk/pa/cm201617/cmselect/cmniaf/51/5106.htm

Acronym	Term
CEDaR	Centre for Environmental Data and Reporting
CIfA	Chartered Institute for Archaeologists
CIEEM	Chartered Institute of Ecology and Environmental Management
CIRIA	The Construction Industry Research and Information Association
CO_2	Carbon Dioxide
DA	Drainage Assessment
DAERA	Department of Agriculture, Environment and Rural Affairs
dB	Decibel
dB(A)	A-weighted decibel
DBERR	Department for Business, Enterprise and Regulatory Reform
DBEIS	Department of Business, Energy & Industrial Strategy
DCAN	Development Control Advice Note
DCEMP	Decommissioning / Construction Environmental Management Plan
DETI	Department for Enterprise, Trade and Investment
DfC	Department of Communities
DfI	Department for Infrastructure
DMRB	Design Manual for Roads and Bridges
DoE	Department of Environment
DoENI	Department of the Environment Northern Ireland
DTI	Department of Trade and Industry
DWI	Drinking Water Inspection
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EPA	The Environmental Protection Act 1990
ES	Environmental Statement
f	Frequency
ft	feet
FTE	Full time equivalent
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPG	The Good Practice Guide
GPP	Guidance for Pollution Prevention
GSNI	Geological Survey of Northern Ireland
GVA	Grass Value Added
GWDTE	Groundwater Dependent Terrestrial Ecosystems
ha	Hectare
HB	Historic Building
HED	Historic Environment Division
HGV	Heavy Goods Vehicle
HMP	Habitat Management Plan
Hz	Hertz

Acronym	Term
H&S	Health and Safety
ICOMOS	International Council on Monuments and Sites
IEMA	The Institute of Environmental Management and Assessment
IEF	Important Ecological Feature
IGR	Irish Grid Reference
IOA	Institute of Acoustics
km	kilometres
kV	kiloVolts
$L_{A90,t}$	A-weighted background noise level for a period of time
$L_{Aeq,t}$	A weighted equivalent continuous sound pressure level for a period of time
LCRE	Low Carbon Renewable Energy
LCA	Landscape Character Area
LCT	Landscape Character Type
LDP	Local Development Plan
LGD	Local Government District
LVIA	Landscape and Visual Impact Assessment
L_w	Sound Power Level
m	metres
m^2	Metres squared
m^3	Cubic metres
ms^{-1}	Meters per second
MW	MegaWatts
NAP	The Northern Area Plan
NCR	National Cycle Route
NED	Natural Environment Division
NI	Northern Ireland
NIE	Northern Ireland Electricity
NIEA	Northern Ireland Environment Agency
NILCA	Northern Ireland Landscape Character Assessment
NIRIG	Northern Ireland Renewables Industry Group
NITB	Northern Irish Tourism Board
NNR	National Nature Reserve
NRFA	National River Flow Archive
NVC	National Vegetation Classification System
OAM	Other Amplitude Modulation
OSNI	Ordnance Survey of Northern Ireland
PAC	Pre-Application Consultation
PAN	Planning Advice Note
PID	Public Information Day
PMP	Peat Management Plan
PPG	Pollution Prevention Guidelines
PPP	Pollution Prevention Plan
PPS	Planning Policy Statement

Acronym	Term
PSRA	Peat Slide Risk Assessment
PWS	Private Water Supplies
RDS	Regional Development Strategy
RG	Registered Garden
RoW	Right of Way
RTC	Road Traffic Collisions
SAC	Special Area of Conservation
SDL	Settlement Development Limit
SEF	Strategic Energy Framework
SEPA	Scottish Environment Protection Agency
SGN	Supplementary Guidance Note
SLNCI	Sites of Local Nature Conservation Importance
SMR	Sites and Monuments Record
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPG	Supplementary Planning Guidance
SPPS	Strategic Planning Policy Statement
SPR	ScottishPower Renewables
SuDS	Sustainable Drainage Systems
t	Tonnes
TA	Transport Assessment
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
The EIA Regulations	The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017
UK	United Kingdom
V	Volts
VP	Viewpoint
WCEMP	Water Construction Environmental Management Plan
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility

2 EIA Methodology

2.1 Introduction

1. EIA is a process aimed to ensure that permissions for developments with potentially significant effects on the environment are granted only after an assessment of the likely significant environmental effects has been carried out. The assessment must be carried out following consultation with statutory consultees, other interested parties and members of the public. This chapter of the ES describes the EIA process for the Development and is supported by the following Technical Appendices:

- Technical Appendix A2.1: Scoping Report (submitted August 2017);
- Technical Appendix A2.2: Scoping Opinion (received 28th February 2018); and
- Technical Appendix A2.3: List of Cumulative Sites.

2. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction**, **Table 1.4**.

2.2 EIA Process

3. The legislative framework for EIA is set out by the EIA Directive, (European Directive 2011/92/EU[1], as amended by Directive 2014/52/EU[2]). The requirements of the EIA Directive are transposed by the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[3] ('the EIA Regulations').

4. The EIA Directive aims to ensure that a planning authority granting planning permission for a development proposal makes its decision with the full knowledge of any likely significant effects on the environment by setting out a procedure known as environmental impact assessment to assess such effects.

5. Schedule 2 of the EIA Regulations lists developments for which an EIA is required for certain types of development where there are likely to be significant effects on the environment by virtue of factors such as the nature, size or location of the development proposal. The following paragraphs under Schedule 2 are of relevance to the Development:

- Paragraph 3(j) includes "installations for the harnessing of wind power for energy production (wind farms)"; and
- Paragraph 13(a) includes "Any change to or extension of development of a description listed…where that development is already authorised, executed or in the process of being executed".

6. As the Development falls under Paragraph 3 (j) and Paragraph 13 (a) of Schedule 2 of the EIA Regulations, and because of the proposed height and total number of turbines included within the Development, the Applicant determined that an EIA should be carried out and is submitting this ES as part of the planning application.

7. Schedule 4 of the EIA Regulations details what information is required to be included within the ES. The following paragraphs under Schedule 4 are of relevance to the Development and this ES:

- Paragraph 3: "A description of the relevant aspects of the current state of the environment (the "baseline scenario") and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge."
- Paragraph 4: " A description of the factors specified in regulation 5(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape."

[1] The European Council Directive 2011/92/EU. Available online at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32011L0092 [Accessed 16/10/2017]
[2] The European Council Directive 2014/52/EU. Available online at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0052 [Accessed 15/11/2017]

8. The results of the EIA will be presented in an ES which, as prescribed in the EIA Regulations, are required to include a *"description of the likely significant effects"* of the Development; effects which are not considered to be significant do not need to be described. It is therefore necessary for the scope of the EIA to be appropriately and clearly defined to ensure that only likely significant effects are identified, described and assessed.

2.3 EIA Methodology

9. The ES has been prepared following a systematic approach to EIA and project design. The process of distinguishing environmental effects is iterative and cyclical, running concurrent with the design process. The main stages to EIA are:

- Scoping and ongoing consultation, including consideration of responses from all parties and how these should be addressed;
- Technical environmental assessments - including baseline studies, input to the design process, identification of potential significant environmental effects and identification of suitable mitigation and improvement measures;
- Preparation of the ES; and
- Submission of the planning application and ES including publicity of the ES.

2.3.1 Scoping and Consultation

10. Consultation has an essential role throughout the EIA process, including at the time of the following key stages:

- Pre-scoping - procuring initial feedback on the Development;
- Scoping and public information days - documentation of key issues;
- Technical Assessments - gathering baseline information from relevant organisations and confirming survey methodologies;
- Informing site design - communication with statutory and non- statutory consultees and local communities and consideration of baseline information; and
- Discussing opportunities for mitigation and improvement with statutory and non-statutory consultees.

11. Further information regarding consultation is outlined within the individual technical chapters.

2.3.1.1 Scoping

12. The aim of the Scoping process is to identify key environmental issues at an early stage, to determine which elements of the Development are likely to cause significant environmental effects and identify areas that can be 'scoped out' of the assessment. This focuses the next phase of assessment on likely significant effects only.

13. In light of this, the Applicant sought to advance the collation of baseline information by undertaking early stage consultation, field surveys and desk-based assessment for each of the technical areas assessed in **Chapters 6 – 14** in advance of preparing the Scoping Report. The findings were described in the Scoping Report, and together with independent professional judgement, formed the basis of the recommendation to 'scope in' or 'scope out' each element of the assessment.

14. The request for a Scoping Opinion was submitted to the Council in August 2017. The request was accompanied by the Scoping Report which described the Development, the proposed EIA methodology and the key areas to be 'scoped in' or 'scoped out' of any further assessment. The document was also sent to a range of consultees as agreed in advance with the Council by the authors of the ES.

15. A copy of the Scoping Report is included as **Technical Appendix A2.1**.

16. The Scoping Opinion was issued by the Council and received on 28th February 2018, a copy of which is included as **Technical Appendix A2.2**.

17. **Table 2.1** provides an overview of the comments raised by the consultees at the scoping stage. The detail of the individual responses received from consultees during consultation, including at the scoping stage, is set out in the relevant technical chapters. Where appropriate in the technical chapters, reference is provided as to where the comments have been addressed

[3] The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 Available online at: https://www.legislation.gov.uk/nisr/2017/83/contents/made [Accessed 16/10/2017]

within this ES .Where a Consultee agreed or disagreed with 'scoping out' a technical area from further assessment, and where reasoning was provided this information has been considered and further assessment of this technical area undertaken as appropriate.

Table 2.1 Scoping Responses

Consultee	No Response	No comments	Referral to other consultees	Planning Policy	Landscape and Visual	Ecology / Ornithology	Hydrology / Hydrogeology	Cultural Heritage	Noise	Existing infrastructure	Shadow Flicker / Reflectivity	Access / Traffic	Cumulative Effects	Construction	Operational Works	Other Issues
British Horse Society	✓															
The Honourable The Irish Society		✓														
Glenravel Rambling Club	✓															
Ulster Federation of Rambling Clubs (Governing body for Rambling and Hill-Walking Clubs in the North of Ireland)	✓															
Walk Northern Ireland	✓															
National Trust (Northern Ireland)	✓															
Department for Infrastructure (DfI) - Roads												✓				
Causeway Coast and Glens Borough Council (CCGBC)– Planning Department			✓	✓							✓					✓
CCGBC – Coast and Countryside	✓															
CCGBC – Environmental Health									✓							
CCGBC – Biodiversity	✓															
Department of Agriculture, Environment and Rural Affairs (DAERA) - Marine and Fisheries Division							✓									
DAERA - Countryside Management Branch	✓															
DAERA - Northern Ireland Environment Agency (NIEA) Water Management Unit							✓									
DAERA - NIEA Natural Environment Division						✓	✓							✓		✓
DAERA - NIEA Countryside, Coast & Landscape Team	✓															
DAERA - NIEA Conservation Science (Ornithologist)	✓															
DAERA - Council for Nature Conservation and the Countryside	✓															
DAERA Inland Fisheries Group							✓									
Department for Communities (DfC)- Historic Environment Division (HED) – Buildings & Monuments								✓								
DfI Rivers Planning Unit							✓									
Forest Service						✓	✓	✓				✓				
Shared Environmental Services						✓	✓									
Royal Society for the Protection of Birds						✓										
Department of Enterprise, Trade and Investment (DETI) - Geological Survey (NI)							✓									
Northern Ireland Water																✓
Belfast International Airport	✓															
Ministry of Defence																✓

2.3.1.2 Public consultation

18. Three rounds of Public Information Days (PIDs) were undertaken for this Development. The first round of PIDs were held on the 22nd and 23rd August 2017 at the Glenravel Sports and Community Complex in Ballymena and Loughgiel Millennium Centre respectively. The events ran from 2pm until 8pm on both dates with 17 attendees at Glenravel Sports centre and 9 attendees at the Millennium Centre. The aim of the first round of information days was to invite comments and obtain feedback in the early design stages to ensure that local considerations helped to inform design decisions.

19. Of the 26 people attending the first round of exhibitions, 11 completed feedback forms, 10 people felt that repowering the Operational Corkey Windfarm was a good idea and one person was unsure. No responses were received that indicated they were against the concept of repowering the Operational Corkey Windfarm.

20. One key issue that was raised at the consultation events related to the ornithological impacts and the effect the height of the wind turbines may have on migratory geese on their flight path. All potential ornithological effects of the Development have been assessed with Waterbirds and Wildfowl considered specifically in **Chapter 9: Ornithology**.

21. The other aspects of interest to the local community centred on community funds and benefits to the local economy. These elements are discussed in **Chapter 13: Socio Economics, land-Use and Tourism.**

22. The second round of PIDs were held on the 4th and 5th of June 2019 at the Glenravel Sports and Community Complex in Ballymena and Loughgiel Millennium Centre respectively. Similarly both events ran from 2pm until 8pm, with 3 attendees at Glenravel Sports centre and 16 attendees at the Millennium Centre. The aim of this second round of information days was to present the final design reached following the rigorous EIA process.

23. Of the 19 people attending the second round of exhibitions, seven completed feedback forms, all those who completed forms felt that repowering the Operational Corkey Windfarm was a good idea and good for both the environment and the local

community. No responses were received that indicated they were against the concept of repowering the Operational Corkey Windfarm, although one attendee who declined to complete a form, voiced concerns over commercial scale wind farm developments compared with single turbine developments.

24. A final PID was held at the Loughgiel Millennium Centre on 26th June 2019 running from 10am up until 12:30pm to meet statutory requirements.

25. Further information on the PIDs, including feedback from attendees and responses as relevant is provided in the Pre-Application Consultation (PAC) Report. The PAC Report has been submitted to the Council as a standalone document as part of the planning application. The PAC Report summarises the consultation that has been undertaken with the local community, detailing how comments received were responded to.

2.3.2 Technical Assessments

26. Each of the technical assessments follows a systematic approach with the main steps as follows:

- Introduction, assessment methodology and significance criteria;
- Description of the baseline conditions;
- Assessment of potential effects;
- Mitigation measures and residual effects;
- Cumulative effects assessment;
- Summary of effects (residual effects); and
- Statement of significance.

27. A summary of each step is highlighted below.

2.3.2.1 Introduction, Assessment Methodology and Significance Criteria

28. Each technical assessment sets out the legislation, policy and guidance together with scope and methodology used to carry out the assessment of potential effects, including the criteria that are used to establish which effects are significant. The methodology seeks to ensure transparency in the assessment. Where a level of significance is attributed to an effect, this is based on technical guidance and professional judgement and generally informed by consideration of the sensitivity of the receptor, and the degree of the effect.

2.3.2.2 Description of Baseline Conditions

29. In this case, the Operational Corkey Windfarm has been operating for over 20 years and holds a consent in perpetuity. The baseline scenario for the EIA is therefore not that of an undisturbed greenfield site. The ES includes;

"A description of the relevant aspects of the current state of the environment (the 'baseline scenario' and an outline of the likely evolution thereof without implementation of the project as far as its natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of relevant information and scientific knowledge."

30. The assessments therefore use a "with windfarm" scenario, taking account of the existing condition of the environment, as the current baseline, this incorporates all existing site infrastructure, access tracks, hardstandings, cables, and substation building as well as the wind turbines, foundations and the current land use management. Having an understanding of, and describing the baseline conditions, provides a base reference against which the changes due to implementation of the Development are measured.

31. An understanding of the current baseline conditions allows an assessor to evaluate the sensitivity of any receptors within defined study areas This data was obtained through online searches of the Northern Ireland Planning Portal and other renewable technology databases. A cut-off date of 3 months prior to submission for single turbines and 6 months for windfarms was requested by the Council in May 2018, in respect of the collation of cumulative data. The final update of both sets of data was carried out in March 2019, 3 months prior to the anticipated submission date of June 2019. A list of all single wind turbines and windfarms within 5km of the Site centre, was obtained from the Council in May 2019. No height threshold was applied to this search. A list of the consented single turbines and windfarms included within the EIA is provided within **Technical Appendix A2.3**. Technical assessments have been based on this complied list, with those relevant to each technical discipline selected.

32. Windfarms that are operational or consented as of March 2019, are also treated as forming part of the existing baseline, except where specific guidance advises to the contrary. Baseline conditions as relevant to each technical area, the identification of any sensitive receptors, and a description of the study areas used, are set out in each of the technical assessment chapters.

33. Information gathered on baseline conditions, particularly any sensitive receptors, is used to inform the design process, and inform a constraints mapping exercise. Further detail on the design process adopted for the Development is specified in **Chapter 4: Site Selection and Alternative Layouts** of this ES.

2.3.2.3 Assessment of Potential Effects

34. The prediction of potential significant effects comprises of both the initial decommissioning of the Operational Corkey Windfarm and the construction and operation of the Development, Different environmental effects are likely to occur during different stages of the Development, effects taking place during the initial decommissioning and construction stages are generally considered to be short term and reversible. Those arising as a result of the operation of the Development are generally considered to be permanent but reversible upon future decommissioning of the Development. Decommissioning of the repowered windfarm is considered to be no greater than those effects assessed as part of the combined initial decommissioning and construction stages of the Development. Each technical assessment considers the nature of the effects and includes any possible cumulative effects with other developments where appropriate.

35. The significance of effects resulting from the Development will be determined through consideration of a combination of the sensitivity of the receiving environment and the predicted level of change from the baseline state. Environmental sensitivity can be categorised by several aspects including factors such as the transformation of natural landscapes, the protection afforded to and presence of rare or endangered species, land use and soil quality.

36. The sensitivity classification of the receiving environment varies between the different technical areas of assessment e.g. ecology, hydrology, landscape and visual etc.

37. For the purposes of environmental assessment, the magnitude of an 'effect' is generally classified as:

- No effect- no change to the location, environment, species or sensitive receptor;
- Negligible- no detectable change to a location, environment, species or sensitive receptor;
- Minor- a detectable but non-material change to a location, environment, species or sensitive receptor;
- Moderate- a material, but non-fundamental change to a location, environment, species or sensitive receptor; and
- Major- a fundamental change to a location, environment, species or sensitive receptor.

38. This ES largely follows the above principles in relation to the identification of significant effects; however, some technical assessments may adopt an alternative to this process, such as following technical guidance bespoke to that topic for example **Chapter 10: Noise**, which establishes whether recommended noise limits are identified as being met or not met. The assessment criteria used to determine the significance of effects are made clear in each technical assessment chapter within this ES. **Table 2.2** highlights the general framework for assessing the significance of effects. Effects of major or moderate significance are considered to be Significant Effects in the context of EIA Regulations.

Table 2.2: Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

2.3.2.4 Mitigation Measures and Residual Effects

40. The institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment[4] explains how EIA is an iterative process rather than a unique, post design, environmental appraisal. In adopting this approach, the outcomes of the technical environmental assessments are used to advise the design of the Development, and hence attain a 'best fit' with the environment. This approach has been adopted in respect of the Development, where potentially significant effects have been identified; their avoidance or reduction has been prioritised at the design stage. This is referred to within this ES as 'embedded mitigation', i.e. mitigation that is implemented within the project design, and includes best practice in implementing the design, as well as design features.

41. The design strategy of 'avoidance, reduction and remediation' is a hierarchical one, which seeks to:

1. Avoid all potential effects;
2. Reduce those which remain; and
3. Where no mitigation measures are possible, to propose compensatory measures.

42. All appropriate mitigation measures are discussed within each technical chapter of this ES.

2.3.2.5 Cumulative Effects Assessment

43. In accordance with the EIA Regulations, the assessment has considered 'cumulative effects' which by definition, are effects that result from increasing changes caused by past, present or reasonably foreseeable developments together with the Development. For the cumulative assessment, the combined effects of several developments that may on an individual basis be insignificant, but cumulatively may give rise to a significant effect, have been considered.

44. Cumulative assessment, addresses the combined effects from the addition of the Development to a baseline of identified windfarms and projects on all technical areas addressed by the ES. As discussed in **Section 2.3.2.2** a cut-off date of 3 months prior to submission for single turbines and 6 months for windfarms was requested by the Council. This has been supplemented by a final list obtained from the Council in May 2019, of all single wind turbines and windfarms within 5 km of the Site centre.

45. Other potential developments which do not currently have sufficient information available in relation to their likely effects to make an informed cumulative assessment are not considered in detail in this ES.

46. The extent of any cumulative assessment is described in each technical assessment chapter of this ES and can include both existing and proposed windfarm developments and other forms of development. The potential landscape and visual effects, for example, which relate to intervisibility of individual windfarms will be much more wide ranging than noise effects which will be limited to receptors in the more immediate vicinity of the developments.

47. Consideration of cumulative effects has been undertaken for all technical assessments. Where no cumulative effects are probable, this is stated. In relation to some of the technical chapters, specific guidance and policy exists advising that effects associated with existing windfarms should be considered as cumulative effects. Where relevant, these are documented within each chapter.

2.3.2.6 Summary of Effects (Residual Effects)

48. The residual effects of the Development are those that remain, assuming successful implementation of the identified mitigation measures where relevant.

49. Residual effects are identified in each technical assessment and summarised in **Chapter 15: Summary of Mitigation** alongside an assessment of whether any residual effects are significant or not in terms of the EIA Regulations. Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations and are highlighted in light green in **Table 2.2.**

2.3.2.7 Statement of Significance

50. The statement of significance draws together the findings of each technical assessment in order to provide an overall conclusion as to the significance of the development under the terms of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.

2.4 Assumptions and Limitations of this ES

51. Several assumptions have been made during the preparation of this ES and are set out below. Assumptions specific to certain environmental aspects are discussed in the relevant Chapters of the ES. The assumptions are:

- The main land uses adjacent to the Development area remain as they are at the time of submission of the planning application, except in cases where planning permission has already been granted for development. In some cases, it is assumed that the approved development will take place, and these have been treated as receptors for potential effects or as contributing to effects; and
- Information provided by third parties, including publicly-available information and databases is correct at the time of producing the ES (2019).

52. The EIA has been subject to the following assumptions:

- Baseline conditions have been assumed to be accurate at the time of the physical surveys but, due to the dynamic nature of the environment, conditions may change during the site preparation, decommissioning, construction and operational phases;
- The assessment of cumulative effects has been reliant on the availability of information on existing, consented and proposed windfarm developments as of May 2019.

53. The information that an application is required to submit as part of the EIA process is presented in this ES. The preparation and production of this ES has been conducted in accordance with relevant regulations and good practice guidance. Relevant legislation, policy and guidance are referred to in each technical assessment chapter within this ES. Principal regulation, policy and guidance documents that have been used in preparing this ES are:

- IEMA Guidelines for Environmental Impact Assessment 2004[5];
- IEMA Guidelines for Environmental Impact Assessment Guide to Delivering Quality Development 20164;
- IEMA Guidelines for Delivering Proportionate Environmental Impact Assessment 2017[6];
- The Planning Act (Northern Ireland) 2011[7];
- The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017[8];
- Strategic Planning Policy Statement for Northern Ireland (SPPS), the Northern Irish Government, 2015[9];
- Information Leaflet 5: Environmental Impact Assessment, the Northern Irish Government 2012[10]; and
- Planning Advice Note (PAN) 10/1999: Environmental Impact Assessment, the Northern Irish Government. 1999[11].

54. This ES reports the findings of the assessment of the potential significant environmental effects of the Development, both in isolation and cumulatively, during the decommissioning of the Operational Corkey Windfarm and the construction and operation of the Development.

55. The ES includes chapters covering the following technical areas:

- Chapter 6: Landscape and Visual Amenity;

[4] IEMA (2016) Environmental Impact Assessment Guide to: Delivering Quality Development. Available online at: https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf [Accessed 18/10/2017]
[5]IEMA (2004) Institute of Environmental Management and Assessment: London. Guidelines for Environmental Impact Assessment, 2004. Available online at: http://bailey.persona-pi.com/Public-Inquiries/Barking%20Riverside/B-Core%20Documents/Category%20D%20National,%20London%20and%20Local%20Policy%20and%20Guidanc%20Documents/D6%20-%20Evironmental%20Assessment%20Impact.pdf [Accessed 07/02/2019]
[6] IEMA (2017) Institute of Environmental Management Assessment 2017. Available online at: https://www.iema.net/policy/ia/proportionate-eia-guidance-2017.pdf [Accessed 07/02/2019]
[7]The Planning Act (Northern Ireland) 2011. Available online at: https://www.legislation.gov.uk/nia/2011/25/contents [Accessed 07/02/2019]
[8] The Planning (Environmental Impact Assessment) Regulation 2017. Available online at: https://www.legislation.gov.uk/nisr/2017/83/note/made [Accessed 07/02/2019]
[9] Department of the Environment. Strategic Planning Policy Statement for Northern Ireland (SPPS) 2015. Available online at: https://www.planningni.gov.uk/index/policy/spps_28_september_2015-3.pdf [Accessed 07/02/2019]
[10] Information Leaflet 5: Environmental Impact Assessment. Available online at: https://www.planningni.gov.uk/index/advice/advice_leaflets/leaflet05.htm [Accessed 07/02/2019]
[11] The Planning Service. Planning Advice Note 10/1999 Environmental Impact Assessment. Available online at: https://www.planningni.gov.uk/downloads/dcan10-eia.pdf [Accessed 18/10/2017]

- Chapter 7: Hydrology, Hydrogeology, Geology, Soil and Peat;
- Chapter 8: Ecology and Fisheries;
- Chapter 9: Ornithology;
- Chapter 10: Noise;
- Chapter 11: Archaeology and Cultural Heritage;
- Chapter 12: Access, Transport and Traffic;
- Chapter 13: Tourism, Recreation and Socio-Economics; and
- Chapter 14: Other Issues and Interrelationships.

56. Each of the technical chapters follows the broad assessment principles outlined **in Section 2.3.2**, although each chapter provides information on the assessment undertaken. **Chapter 15: Summary of Effects and Mitigation** of this ES presents a summary of the main residual effects of the Development, along with a summary of the main environmental commitments.

2.5 Scoped Out Effects

57. Following preliminary consultation with key consultees during the scoping process, desk based assessments, site visits and field surveys, and in line with The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 ('the EIA Regulations'), this ES aims to focus the assessment solely on those elements likely to provide a significant effect. Those topics and factors identified through the scoping process as not likely to have significant effects have not been considered further within this ES. Table 2.3 below provides a summary of topic areas that have been scoped out. This approach to the assessment is supported by the Scoping Opinion received from CCBGC and included in **Technical Appendix A2.2 Scoping Opinion**.

Table 2.3 Technical Topics scoped out as Not Significant

Technical Area	Elements Scoped Out of the EIA
Landscape and Visual Amenity	• All Landscape Character Areas beyond 15 km of the Site; • Four Landscape Character Areas within 15 km of the Site; • Registered Gardens and Supplementary Sites beyond 15 km; 2 Areas of Outstanding Natural Beauty; • 1 Area of High Scenic Value; • Settlements beyond 20 km; • Rail and road routes beyond 10 km; and • Regional and national cycle routes and links beyond 15 km.
Ecology	• Upland acid grassland and improved grassland habitats; • Rare or protected flora; • All terrestrial mammals other than badger; • Common lizards and smooth newts; • Direct effects on fisheries and other aquatic fauna; and • Marsh fritillary butterflies or any other protected / priority invertebrates.
Ornithology	Subject to presentation of data and appropriate windfarm design and mitigation, particularly in relation to construction: • Curlew impacts via design and set-back distances • Snipe effects based on evidence of habituation and sensitive timing of construction management • Collision / displacement to whooper swans and geese based on set-back distances • Collision risk to golden plover based on published evidence and low collision likelihood
Noise	• Construction Noise; • Low Frequency Noise and Infrasound; • Vibration; • Amplitude Modulation (AM); and • Noise from Energy Storage Unit.
Archaeology and Cultural Heritage	• Indirect effects on heritage assets not within the Zone of Theoretical Visibility.
Access, Transport and Traffic	• Operational traffic assessment.
Hydrology, Hydrogeology, Geology, Soils and Peat	• Receptors beyond 10 km of the Site; Effects on Bush Reservoir; and • Potential effects arising from contaminated land.
Tourism, Recreation and Socio-Economics	• Direct effects on tourism and recreation receptors.
Other Issues	• Turbine reflectivity; • Potential interactions with Human Health including Health and Safety best practice, ice, and lightning strike • The vulnerability and resilience of the development to climate change effects; and • Waste.

3 Development Description

3.1 Introduction

1. This Chapter of the Environmental Statement (ES) provides a description of the proposed repowering of the Operational Corkey Windfarm (the Development) which forms the basis of the assessments presented within **Chapters 6 to 14.** It provides details of the decommissioning and construction, and operational phases of the Development.

2. This Chapter includes an overview of the Development followed by a detailed description of the main components and their method of construction. Measures that have been built into the design of the Development to reduce effects, also known as 'embedded' mitigation measures, are set out in the following Chapter (**Chapter 4: Site Selection and Design Strategy**) and in this chapter. In addition to these embedded mitigation measures, **Chapters 6 to 14** present mitigation and enhancement measures where specifically relevant to their assessment topic.

3. This Chapter of the ES is supported by the following Technical Appendix documents provided in Volume 3:

- Technical Appendix A3.1: Outline Decommissioning and Construction Environmental Management Plan (DCEMP); and
- Technical Appendix A3.2: Draft Habitat Management Plan (Draft HMP).

4. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

3.2 Description of the Development Site and Surrounding Land

5. The Site is located within the Causeway Coast and Glens Borough Council (the Council) administrative area. The location of the Site is shown on **Figure 3.1**, and is approximately 18 kilometres (km) north of Ballymena in County Antrim. The Operational Corkey Windfarm is located within the Site as detailed in the following section and shown in **Figure 3.2.** A comparison with the Operational Corkey Windfarm layout is shown in **Figure 3.3**.

6. The Site is located on the western periphery of the Antrim Hills with the low-lying valley of the River Main to the west and the broader range of the Antrim Hills to the east. The Site is characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan and its moorland land cover. The predominant land use, in conjunction with the Operational Corkey Windfarm, is agricultural. Elevations within the Site range from approximately 160 metres (m) above ordnance datum (AOD) in the south-west of the Site to approximately 410 m AOD at the east of the Site.

7. There are a number of small unnamed watercourses and man-made open field drains within the Site, the majority of which drain in a westerly direction although some drain northwards. There are no public roads within the Site, although Corkey Road runs adjacent to sections of the Site Boundary to the west and Reservoir Road runs adjacent to sections of the Site Boundary to the north-west.

8. The historical land ownership pattern of this area is based on the land being divided into small plots. This has led to a dispersed settlement pattern, whereby individual dwellings occur frequently across the landscape, accessed by the network of rural roads. The closest settlements to the Development include the small village of Corkey located approximately 1.56 km west of turbine 4, the village of Loughgiel located approximately 3.46 km north-west of turbine 3, and the village of Clough Mills located approximately 5.28 km south-west of turbine 4.

9. Domestic scale and single wind turbines are a frequent feature in the valley landscape, often associated with farmsteads or domestic dwellings. Larger commercial windfarms are also a feature, albeit typically seen set on the enclosing ridgelines of the upland areas to the west and east of the Site. Immediately adjacent to the Site lies Gruig Windfarm which consists of ten 2.5 MW turbines with tip heights of 100 m.

3.3 Description of the Operational Corkey Windfarm

10. The Operational Corkey Windfarm was developed and constructed by RES and B9 Energy Services in 1994, and then acquired by ScottishPower Renewables (the Applicant) who own and operate the Site. The Operational Corkey Windfarm has consent in perpetuity and consists of ten 500 kilowatt (kW) Nordtank turbines with tip heights of 57 m and associated infrastructure including access tracks, substation and a meteorological mast. The ten existing turbines associated with the Operational Corkey Windfarm are located broadly in two rows running roughly in parallel with the ridgeline as shown in **Figure 3.3**, and is currently accessed from Reservoir Road.

11. The Development is for the decommissioning and repowering of the Operational Corkey Windfarm, which will entail replacing the operational wind turbines and infrastructure including the substation and meteorological mast, while existing infrastructure will be re-used insofar as possible. The substation, together with a number of redundant tracks and hardstanding areas will be removed with materials being reused within the construction processes wherever possible, a number of these areas will then be re-instated in accordance with reinstatement principals outlined within this chapter, the Outline DCEMP and the Draft HMP.

3.4 Overview of the Development

12. The assessment will consider the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

13. The decommissioning of the Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a lesser effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development are considered to be no greater than the effects arising when these two phases are combined. As a result the final decommissioning phase has not been considered further in the assessment chapters.

14. The Development will comprise of the following main components:

- Decommissioning of the existing 10 turbines;
- Removal and restoration of the existing substation building and compound in accordance with the Outline DCEMP and Draft HMP;
- Removal and restoration of other redundant infrastructure in accordance with the Outline DCEMP and Draft HMP;
- The erection of 5 three bladed horizontal axis wind turbines of up to 137 m tip height;
- Turbine foundations;
- Construction of approximately 1.955 km of new access tracks;
- Upgrade of approximately 2.095 km of existing access tracks;
- Construction of temporary and permanent hardstanding areas for each turbine to accommodate turbine component laydown areas, crane hardstanding areas and external transformers and/or switchgears;
- 3 temporary construction compound/laydown areas (some areas may be reinstated temporarily if required for future operational and decommissioning purposes);
- Turning heads and passing places incorporated within the site access infrastructure;
- New road junction with Reservoir Road;
- Three upgraded water crossings and five new water crossings;
- Meteorological Mast;
- Buried underground electrical and communication cables;
- Substation, with roof mounted solar panels, and associated compound, including windfarm and grid connection operating equipment;
- Energy Storage Unit;
- Associated ancillary works; and
- Micrositing allowance of 50m deviation (in all directions) from the indicative design footprint.

15. The layout of the Development is shown in **Figure 3.2** and details of each component are provided below in **Table 3.1**. The additional land-take for the Development is shown below and compared to that of the existing Operational Corkey Windfarm footprint. The total land-take required for the Operational Phase will require approximately 1.14 ha of redundant land to be reinstated and 8.19 ha of additional land take.

Table 3.1: Temporary and Permanent Land-Take and Re-instatement Areas

Development Element	Existing Site area (ha)	Redundant area to be re-instated (ha)	Additional Land-take for the Development (ha)	Total Site area for the Operational Phase (ha)
Turbine Foundations	-	-	0.117	0.17
Crane Hardstandings, including earthworks and verges	Included in access track figure below	-	1.96	1.96
Blade Laydown Areas, including earthworks and verges	-	-	1.46	1.46
Access Tracks, including junction improvements	2.02	1.04	3.45	4.43
Substation Compound including Energy Storage Units compound	0.05	0.05	0.17	0.17
Windfarm Construction Compound	-	-	0.39	-
Total	2.12	1.14	8.58	8.19

3.5 The Development Components

3.5.1 Wind Turbines

16. Planning permission is being sought for the erection of up to five three-bladed horizontal axis wind turbines with a maximum height from base to tip that will not exceed 137 m (with a blade in the vertical position). Figure 3.4 illustrates a turbine of this type. The blades will be made of fiberglass reinforced epoxy and mounted on a tapered tubular steel or steel and concrete tower. The turbines will be of a typical modern, three blade, horizontal axis design, light grey in colour and the finish of the tower and blades will be semi-gloss and semi-matt respectively.

17. Each of the turbines comprises of the following components:

- Blades;
- A tower;
- A nacelle;
- A hub; and
- An external transformer and/or external switchgear**.**

18. The final choice of turbines will be guided by an assessment of the wind conditions, this Environmental Impact Assessment (EIA) together with feedback from consultation, and a pre-construction tendering exercise which will take account of the available technology at the time of construction. Currently it is considered likely that turbines with c. 4 MW capacity may be available within the envelope of the proposed physical parameters as defined within **Table 3.2.** For the purposes of the assessments a “candidate turbine” has been selected based on the precautionary principle of assessing the worst-case scenario.

Table 3.2 Turbine Physical Parameters

Turbine Parameter	Assessment Envelope
Turbine tip height	Up to 137 m
Rotor diameter	Up to 120 m
Tower height	Up to 81 m

19. The turbine tip height will not exceed 137 m with the blades in the vertical position, should a smaller rotor be used as it is likely that a correspondingly taller tower would be selected in order to maintain the overall tip height. The assessment of the candidate turbine has been based upon a maximum rotor of 120 m as this is deemed to be worst case scenario.

20. Turbines are typically of a variable speed type, so that turbine rotor speed will vary according to the energy available in the wind. Turbines with parameters similar to those set out in **Table 3.2** typically have a rotational speed of between 9 and 19 revolutions per minute (rpm), depending on variations in wind speed, generating power for all wind speeds between c. 4 and c. 25 metres per second (m/s). At wind speeds greater than c. 25 m/s, the turbines will automatically shut down for self-protection.

21. The turbines are computer controlled to ensure that at all times, the turbine faces directly into the wind to ensure optimum efficiency. The rotors of all five turbines will rotate in the same direction, however the localised wind conditions will determine the orientation of each turbine individually.

22. In high wind speeds, the wind turbines will yaw out of the prevailing wind through as instructed by their own control software, in an attempt to maintain their operation prior to cutting out should the high wind speed conditions exceed the wind turbine’s safe operating limits.

23. When operating, the rotational speed of the blades is transferred and increased through the gearbox, to drive the generator. This produces a three-phase power output typically at 690 Volts (V), which is transferred from the generator to the turbine transformer. The turbines will be controlled and monitored from within the proposed substation and will also be remotely monitored from the Whitelee Windfarm Control Centre in Scotland, where performance details and statistical information for each turbine will be recorded. Staff servicing the turbines on a routine basis will be based in Northern Ireland. Table 3.3 details the locations of the turbine bases.

Table 3.3: Proposed Turbine Locations

Turbine ID	Co-ordinates (ITM)	
1	311506	422023
2	311146	422326
3	310713	422440
4	310671	421988
5	311046	421744

3.5.2 Turbine Foundations and Crane Hardstandings

24. A full ground investigation will be completed prior to construction, however a typical turbine foundation will consist of an octagonal or circular reinforced concrete base approximately 20.8 m in diameter. A typical turbine foundation is shown in **Figure 3.5**. The area of excavation will be sized accordingly to allow for a stable, clear and safe working area around the concrete turbine foundation. Where possible the areas of the redundant foundations and turbine hard standings which currently form part of the Operational Corkey Windfarm will be re-used to form part of the new hardstanding and laydown areas.

25. Construction of the turbine foundations will generally require the excavation of subsoil to expose a suitable formation material. The formation will be levelled off prior to the in-situ casting of a steel-reinforced concrete foundation. It is estimated that each foundation will require approximately 430 cubic metres (m^3) of concrete and up to 90 tonnes (t) of steel reinforcement. Various cable ducts and other ancillaries will be installed within and adjacent to the foundation. The area above the foundations will be backfilled using suitable granular fill materials up to the turbine foundation plinth, and will form part of the permanent crane hardstanding area for each turbine. The final foundation design will be specific to the turbine selected and the Site conditions as verified during detailed site investigations undertaken prior to construction commencing.

26. Each turbine requires an area of hardstanding adjacent to the turbine foundation to provide a stable base on which to site the turbine components and crane for the erection of the turbine. The working area at each hardstanding area will be approximately 25 m by 65 m. However, the final arrangement of the hardstanding will depend on the selected turbine manufacturer and model, the method of erection and exact specification of the cranes chosen by the turbine erection contractor. The hardstandings will be sufficiently level and with a suitable load-bearing capacity to ensure the safe storage of turbine components and operation of the cranes. Turning areas are provided to facilitate the transportation of turbine components, assembly cranes, and construction traffic onsite. A typical hardstanding arrangement is shown in **Figure 3.6,** and

their indicative location and configuration including turning areas are shown in **Figure 3.2**. The crane hardstandings and turning areas will remain in place during the lifetime of the Development to facilitate maintenance works.

27. Surface water and groundwater levels will be managed to ensure that natural drainage patterns are maintained and that water levels within excavations do not rise beyond appropriate and safe limits. Various cable ducts and other ancillaries will be installed within the foundations and under the access track crossing points. Further detail on drainage is included within the Outline DCEMP, in **Technical Appendix A3.1**.

28. The hardstanding pads will be left in place during the operation of the windfarm in case there is a need to repair or replace any blades, the surrounding areas will be reinstated following construction.

3.5.3 Transformers, Switchgear and Cabling

29. Depending on the final choice of turbine, transformers will either be located within the nacelle which sits at the top of each turbine tower (with internal switchgear), within the tower itself or externally, close to the base of the tower. An external transformer will normally be placed within steel or glass reinforced plastic (GRP) housing along with an external switchgear, on a concrete foundation pad as allowed for as part of the Development and illustrated in **Figure 3. and Figure 3.6**. The size of transformer and switchgear will depend on the type of turbine selected but in general it will be approximately 4 m by 7 m in plan and 3 m in height above surrounding ground level (**Figure 3.4**), located adjacent to the turbine within the hardstanding area.

30. The transformers will be either oil-filled with a bunded footing to remove any risk of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage from c. 690 V to 33 kiloVolts (kV).

31. Turbines will typically each be connected by 3 no. 33 kV single phase power cables which will be laid in shallow trenches alongside the access tracks. The excavated trenches will also include SCADA cables or fibre optic cables. This will allow interrogation and control of individual turbines as well as remote monitoring. A copper cable will also be located in the trench and will be connected to the substation and each turbine to provide an earthing system for protection against lightning strikes and electrical faults. Details of typical trenches are shown in **Figure 3.7**.

3.5.4 Onsite Substation and Associated Compound

32. A new substation will be required as part of the Development. This will be sited within the substation compound and be designed to the standard required by Northern Ireland Electricity (NIE) Networks for the accommodation of substation equipment.

33. The compound as shown in **Figure 3.8** is approximately 35 m x 55 m and contains the substation building and ancillary equipment, including the transformers, switch gear, fault protection, metering, energy storage units, component storage, car parking and other ancillary elements necessary for the operation of the Development.

34. The approximately 16.5 m x 11.5 m x 5 m (to peak of roof) sized substation building will contain control elements of the windfarm. The control components housed at the substation will include metering equipment, switchgear, the central computer system and electrical control panels. A spare parts store and workshop will also be located in the substation. It will have a suitably sized footpath around it and an adjacent parking area. The appearance and finish of the substation building will be similar to an agricultural building, while the final appearance would be agreed with the Council via the use of an appropriately worded planning condition.

35. The wastewater will drain to the septic tank located adjacent to the substation building. If technically feasible, a rainwater harvesting system will be installed as a source of non-potable water for flushing of toilets, etc. Any rainwater not captured by this system will be drained from the substation building compound footprint to a soakaway or a suitable surface water discharge point located in a suitable area nearby. Should oil storage be required, a bunded area will be constructed in a suitable location within the compound. The bund will be designed to have a capacity of 110% of the maximum volume of oil required to be stored within it, and bund design would meet best practice as set out in Guidance for Pollution Prevention 2 (GPP2[1]): Above Ground Oil Storage Tanks.

36. The proposed location and indicative layout of the substation compound is shown in **Figure 3.8**. The indicative elevation drawings and floor plan for the substation building are presented in **Figure 3.10** and **Figure 3.11,** respectively.

37. The finishes of the buildings will match the existing agricultural architecture, and by constructing the new substation in a low-lying and visually enclosed position, potential environmental effects would be minimised. By locating the energy storage unit alongside the substation, the footprint of the Development is minimised and the energy storage units are seen in the context of other Development infrastructure. This will limit its additional landscape and visual effects as buildings will not be introduced to upland parts of the Development, where they are less familiar features. Within the Site the electrical cables will run underground adjacent to the access tracks to the new substation.

3.5.5 Energy Storage Units

38. The Energy Storage Units will be located within the substation compound and are ancillary to the Development. The units will typically consist of containers each approximately 6.1 m x 2.44 m x 2.2 m high. The indicative locations of these units are shown on **Figure 3.8** and typical details are included in **Figure 3.9.**

39. The current energy storage technology favoured today is Li-ion batteries. These batteries are used widely due to their fast response time, which makes them preferable for grid-scale deployment. The Li-ion batteries vary in cell chemistries (e.g., Lithium Iron Phosphate, Lithium Nickel Manganese Cobalt Oxide, Lithium Cobalt Oxide, Lithium-Titanate) and cell arrangement (e.g., cylindrical, pouch, prismatic). Chemistry and arrangement will dictate the batteries' performance characteristics. The final selection of energy storage technology used will be based on the latest technology available at the time of construction, and it is requested that final details of this ancillary element be secured via the use of an appropriately worded planning condition,

3.5.6 Grid Connection

40. Underground cabling, laid where possible alongside the new access tracks, will link the turbine transformers to the onsite substation building. Where existing track is being re-used, the cables will be laid in a cable trench alongside the existing track. Generally, the redundant cable will be removed and recycled or cut off and left in situ as appropriate and in accordance with the Outline DCEMP and Draft HMP, in order to minimise disturbance to the environment.

41. It is envisaged that a new connection to the electrical grid will be required to accommodate this Development. Based on initial discussions with NIE to date, the Applicant is currently investigating connecting to the Rasharkin 'cluster' substation, which is approximately 16 km south-west of the Site. Although the application for connection of the Development to the electrical grid will fall under a separate consenting regime, a high-level desk-based assessment of possible routing options has been undertaken, in order to evaluate the feasibility the of the proposed grid connection. This assessment has been based on a 33 kV overhead wooden pole line. Statutory designations have been plotted and three broad routes, each approximately 1 km in width have been identified (see **Figure 3.15**). The final route selection will be determined by NIE.

3.5.7 Meteorological Mast

42. One permanent meteorological mast is proposed as part of the Development, located at IGR 311207, 422045. This will be used to provide on-going measurement of wind speed to provide information for the control and monitoring of the operation of the Development. The location of the met mast has been selected to provide the best representation of wind speeds across the Site.

43. The meteorological mast will be up to 80 m in total height and will be a galvanised steel lattice construction. It will have a concrete foundation with approximate dimensions of 5 x 5 x 0.5 m and erected using an appropriately sized crane. A typical meteorological mast is shown in **Figure 3.12**. An access track is not required to service the mast, as construction and operation can be undertaken by all-terrain vehicles.

[11] Above ground oil storage tanks: GPP 2, NIEA,SEPA, Natural Resources Wales, Accessed 01/11/2017, http://www.netregs.org.uk/media/1317/gpp-2-pdf-feb-2017.pdf

3.5.8 Temporary Decommissioning and Construction Compounds and Laydown Areas

44. The temporary decommissioning and construction compounds will be located as shown in **Figure 3.2**. These locations have been selected to minimise environmental effects. The compounds will have maximum dimensions of 90 m by 90 m and an indicative compound arrangement is shown in **Figure 3.13.** The compound to the north of T5 is formed in part by an area used for previous site workings the area had be stripped and consists of hardstanding that has partially re-vegetated.

45. The compound will comprise a hardstanding area for parking and for receipt and storage of plant, equipment and delivered materials. In addition, they will form a laydown area for the decommissioned turbine components prior to their removal from the Site. A waste management area will also be provided along with temporary office and welfare facilities, including Portakabin-style toilets with provision for sealed waste storage and removal. Facilities will be provided for diesel storage and generators and an area designated for re-fuelling. The compounds will be restored following the completion of construction works.

46. The area will be stripped of topsoil and subsoil to expose a suitable formation. The stripped material will be stored close by for future re-instatement. A geosynthetic material base or similar will then be laid, followed by a layer of suitable rock material, and then a further geosynthetic material laid prior to the top surface of blended finer aggregate.

47. Following completion of the decommissioning and construction phase, the compound will be removed and the areas restored. These areas may be reinstated in support of any future decommissioning activity as required.

3.5.9 Access to the Development

48. The Development will be accessed via the access track for the Operational Corkey Windfarm. The access route is considered largely suitable for the new turbines, however, two areas require re-alignment to facilitate the delivery of the larger turbines. The realigned route is shown in **Figure 3.2**.

49. A new junction to Reservoir Road is required to the west of the current operational access due to the geometry of larger turbine being unable to follow the initial section of the current access track. The new junction position provides suitable visibility splays for vehicles entering and leaving the Site and relocates the Site entrance away from residential properties to minimise disturbance. This is shown on **Figure 12.5: Proposed Site Access Junction**.

50. An overhead cable runs parallel with Reservoir Road and overhead electricity wires cross Reservoir Road in a perpendicular manner at the entrance to 15 Reservoir Road. Should the overhead infrastructure require alteration, and planned outages are necessary in order to re-locate the cables either by temporarily raising them or permanently burying them underground to facilitate the turbine delivery and ongoing maintenance, best practice measures will be followed. These measures include minimising the length of time any outages occur with residents notified of the planned works in order to minimise any disruption to those residents potentially affected.

51. A transport assessment has been undertaken in support of the application for the Development and this provides details on access route options for decommissioning/construction vehicles and provides an estimate of trip generation during this period. The transport assessment includes a routing study to establish the feasibility of the access route for turbine delivery from either Belfast or Larne to the Site entrance. Details of this and assessment of traffic impacts during the initial decommissioning/construction and operational phases of the Development are provided in **Chapter 12: Access, Traffic and Transport.**

3.5.10 Onsite Access Tracks

52. Where possible the existing spine road and access tracks serving the Operational Corkey Windfarm will be retained, utilised and upgraded as necessary to access the proposed turbine positions. Tracks required to access new elements of the Development will be retained throughout the operational life of the Development to enable maintenance of the turbines and replacement of any turbine components. In total, approximately 1.955 km of new access tracks will be required, with approximately 2.095 km of existing track requiring localised widening.

53. The access track layout has been designed taking into account a range of environmental and technical constraints, including breeding birds, active peat, sensitive habitats and steep slopes. All tracks are designed to respond to turbine supplier track requirements and will provide a 5 m wide running surface with localised widening on corners or areas of steeper slopes and will enable access to the turbine locations. The track spurs will have ‘dead-ends’ with turning heads provided where necessary; these turning heads will reuse areas of existing and redundant infrastructure where possible. Tracks will have passing places where necessary.

54. Access tracks will be constructed with a ‘cut track’ design (as shown in **Figure 3.14**). This construction method will be used as there is less than 1.2 m depth of soft ground in all proposed track locations, and there is no potential peat instability as a consequence of surface loading of the peat. Analysis of peat-depth survey data, collected as part of the EIA process (see **Chapter 7: Hydrology, Hydrogeology, Geology and Peat**, and **Technical Appendix A7.1**: **Peat Slide Risk Assessment**), suggests that the entirety of the proposed new track (1,780 m) is within topsoil or peat of depth less than 1 m (the average depth being less than 0.5 m). In the event that during the construction phase deeper peat is found in isolated pockets, floating road may be considered as an alternative option.

55. Access tracks will be constructed with graded stone aggregate won from cut activities, re-use of existing materials from redundant infrastructure or stone imported from local quarries to provide a level surface and will incorporate geosynthetic layers to strengthen the track as necessary. The running surface will be made of a durable surfacing material resistant to crushing, formed from selected crushed and compacted stone.

56. Construction of a ‘cut track’ design involves the topsoil and peat being stripped to expose a suitable formation on which to build the track. The track will then be constructed on the formation by laying and compacting crushed rock to a depth dependent on ground conditions and topography, although generally the surface of the track will be flush with, or raised slightly above, the surrounding ground level. Geosynthetic layers will be incorporated at the formation and/or within the crushed rock as required to minimise the amount of material required. The upper soil/peat horizon, together with any vegetation, will be placed to one side for later reinstatement, if appropriate.

3.5.10.1 Access Track Drainage and Watercourse Crossings

57. The areas of new access track have been designed to ensure run-off water is adequately drained by ditches into swales and small ponds if necessary and appropriate in accordance with the Outline DCEMP, in order to attenuate flows and remove sediments before the treated run-off is shed onto vegetation or otherwise re-enters the wider hydrological system. The proposed use of channels at the track edges and the use of a wide arched culvert for the watercourse crossings will ensure disruption to the existing drainage regime will be minimised, as described in **Chapter 7: Hydrology, Hydrogeology, Geology and Peat.**

58. The hardstanding at T5 encroaches on a small unnamed watercourse, the preferred option would be to culvert the watercourse in order to construct the hardstanding. T5 is located approximately 45 m south-east of the watercourse. Should a culvert not be technically feasible the watercourse will be diverted, following detailed design of the hardstanding area. The detailed design would aim to minimise direct works to the watercourse. Any works in the vicinity of the watercourse relating to the installation of the culvert, diversion or necessary over-pumping would take place during a dry period to minimise effects on the water environment. Works will be carried out in accordance with GPP5: works or maintenance in or near water. Further details of over-pumping methods are provided in **Technical Appendix A7.2 Outline WCEMP**.

59. The new tracks will have adequate crossfalls or cambers to allow rainwater to be shed and, where gradients are present, lateral drains will intercept flow along the track. A drainage ditch will be formed on the upslope side of new access track where required to collect run off from the upper slopes, with exact arrangements dependent on detailed drainage design.

60. Cross pipes will be laid as required on site to permit good track drainage and will be introduced where the position of the access track would cause ponding to one side. As far as possible, these will coincide with naturally occurring drainage channels.

61. Where existing tracks are being re-used existing drainage measures will be checked to confirm they are still appropriate and operating successfully. Should this not be the case the drainage measure will be upgraded in line with those proposed for new tracks.

62. Features such as silt traps, silt fences and settlement lagoons will be used where necessary to minimise the potential for sediment to enter watercourses As described in **Chapter 7: Hydrology, Hydrogeology, Geology and Peat** in accordance with the Outline WCEMP which will be appended to the Outline DCEMP.

3.5.11 Site Signage

63. During the decommissioning and construction phase, the Site will have suitable signage to protect the health and safety of workers, contractors and the general public.

64. During the operational phase, there will be a sign giving the operator's name, the name of the Development and an emergency contact telephone number. On the turbines and the substation, there will be further signs giving information about the component, potential hazards, the operator's name, the location grid reference and the emergency telephone number. The final location and design of the signage will be defined prior to the Development becoming operational.

65. No Rights of Way (RoWs) will be directly affected by the Development.

3.5.12 Micro-Siting

66. In the event that unsuitable ground conditions are encountered during the construction works, there may be a requirement to micro-site elements of the Development infrastructure in order to further mitigate against any unfavourable ground conditions, or unforeseen environmental constraints. It is proposed that the relocation of turbines and other infrastructure by up to 50 m in all directions may be carried out subject to approval of the Ecological Clerk of Works (ECoW). It is then requested that any relocation of Development components to distances of more than 50 m, will require the written approval of the Council.

67. The potential for micro-siting was considered when the detailed survey and assessment work was undertaken. For example, the habitat and archaeological surveys covered a wider area than just the footprint of the proposed turbine and access track locations (full details of survey areas can be found in the relevant assessment chapters). Any likely significant effects arising from micro-siting have been considered in the preparation of this ES, and specific areas to be avoided have been identified in technical chapters where necessary.

3.6 Decommissioning and Construction Programme

68. The first phase of the Development will comprise the initial decommissioning phase and removal of the existing turbines, external transformers and wind monitoring masts from the Site. It is anticipated that the turbines and external transformers will be carefully dismantled and transported offsite, possibly for resale in the second hand market. For the purposes of undertaking the EIA, it is assumed that the initial decommissioning and construction phases are likely to commence in 2023. The date can only be confirmed following consent for the Development and confirmation of the grid connection timelines by NIE. It will also be influenced by any prevailing market conditions and requirements.

69. The dismantling of the Operational Corkey Windfarm is expected to take approximately two months following an initial period of four weeks during which a temporary decommissioning / construction compound will be constructed and existing tracks and crane hardstandings will be cleared of vegetation and upgraded for use by decommissioning vehicles as required.

70. Following initial track construction and upgrade, cranes will be used to split the turbines into suitable sections, which will then be transported from the Site by heavy goods vehicles (HGVs). Following removal of the blades, power cables will be disconnected and lowered with control cables left in place, before the tower sections are lowered.

71. In those locations where the areas of the turbine and transformer bases will not form part of the new crane hardstanding and laydown areas, they will be cut to 1 m below the surface and backfilled with suitable topsoil, generated from the construction activities elsewhere in the Site. Those areas of hardstanding and access track which are being reused will be retained, whilst unaffected areas of hardstanding and access track that have already naturally regenerated will either be left in situ, or removed and reinstated, with materials reused in the construction activities elsewhere on the Site and in accordance with the Draft HMP and Outline DCEMP.

72. It is expected that the construction phase of the Development will run in parallel with the decommissioning of the Operational Corkey Windfarm and take approximately 8 months in total. This period is somewhat weather dependent and could be affected by onsite conditions. It is envisaged that the decommissioning/construction programme would follow the broad outline as detailed in **Table 3.4**.

Table 3.4 Indicative Decommissioning / Construction programme

Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8
Site Establishment								
Decommissioning of existing turbines								
Access road, upgrade, widening, removal and construction								
Substation and Energy Storage Unit construction								
Excavation and construction of turbine foundations and hardstandings								
Cable installation and electrical works								
Turbine delivery and erection								
Turbine commissioning								
Site restoration								

73. Whilst the decommissioning/construction programme will be developed taking into account the bird breeding season, should works be required over the summer months best practice measures will be utilised to avoid disturbance to birds. It is advantageous for works within the peatland areas of the Site to take place at the driest time of year to minimise disturbance to the peatland habitats and minimise any potential peat slide risk and would be undertaken in line with the Construction Mitigation Strategy described in **Chapter 9: Ornithology**.

74. Other benefits of working over the summer months include:

- Minimising the risks to Site watercourses through the release of sediments during the site excavations, reducing potential risks to downstream watercourses during track construction of upgrade when working in the vicinity of watercourses;
- Longer daylight hours enable longer days of working and provide significant Health and Safety (H&S) benefits to site workforce as working in low light/night time conditions will be limited;
- Typically the spring/summer months exhibit lower wind speeds for turbine erection works, which have positive H&S and programme implications; and
- Overall quality of works in general is more likely to be negatively impacted outside the spring/summer months, e.g., cold weather concreting in winter, weather downtime during high rainfall/high wind events, restrictions on working at height, etc.

3.6.1 Working Hours

75. In general, working hours for decommissioning / construction will be from 07:00 to 19:00 throughout the week, with reduced working hours at weekends. It should be noted that during the turbine erection phase, operations may proceed around the clock to ensure that lifting operations are completed safely. Hours of working will be agreed with the Council prior to the commencement of construction. Any extensions to working hours would be agreed in advance with the Council.

3.7 Site Restoration

76. The outline plan for soil management and restoration includes methods used for reinstatement of both disturbance from the decommissioning and construction activities as well as re-instatement of redundant infrastructure. This forms an integral part of the post-construction restoration programme to be carried out in accordance with the Draft HMP and Outline DCEMP. These methods will be agreed with the Council in consultation with relevant statutory bodies prior to the commencement of restoration works.

77. Site restoration will involve the restoration of track and hardstanding verges and the temporary decommissioning and construction compound to provide a natural ground profile with non-geometric surfaces and tie-ins with existing undisturbed ground levels to prevent the collection of surface water where appropriate. Restoration will be undertaken at the earliest opportunity to minimise storage of turf and other materials. The key elements of the restoration plan are, in summary:

- Track and hardstanding verges on the downhill side will be covered with a layer of turf and associated soil. They will then be left to allow natural succession to take place; this turf will be obtained from areas where shallow organic deposits or otherwise shallower peat deposits ('acrotelmic' peat) have been excavated. A mixture of habitats is expected to develop on track and hardstanding verges on the downhill and uphill sides, because of local variation in soil depth/type and the variety of drainage conditions that will be present, including wet heath, marshy grassland, dry heath and acid grassland;
- The decommissioning and construction compounds will be restored with peat / other organic deposits as appropriate capped with a layer of associated turf. Due to the flat nature of the area where the compounds will be located, it is expected that a mixture of marshy grassland, wet heath along with dry heath/acid grassland will develop;
- Cable trenches would be similarly reinstated. Where practicable, vegetation over the width of the cable trenches would be lifted as turfs, and replaced after trenching operations, to reduce disturbance;
- The upgraded access tracks serving the new turbines will be left in place after completion of the construction phase, as they will provide access for maintenance, repairs and the eventual decommissioning phase;
- Hardstanding and turning areas constructed at each turbine location will be retained for use in ongoing maintenance operations, including component replacement as necessary, and the decommissioning phase; and
- Redundant infrastructure will be removed, or broken out to depth of 1 – 1.5 m and a number of the areas reinstated in accordance with the Draft HMP and Outline DCEMP.

78. Should future works be required to maintain the Development the temporary construction areas may be reused and temporarily reinstated as required for maintenance purposes.

3.8 Decommissioning and Construction Environmental Management Plan

79. The Applicant will appoint an Infrastructure Contractor who will have overall responsibility for environmental management on the decommissioning/construction site (the Contractor). The services of specialist advisors will be retained as appropriate, such as an archaeologist and ecologist, to be called on as required to advise on specific environmental issues. The appointed Contractor will ensure construction activities are carried out in accordance with the mitigation measures outlined in this ES.

80. An Outline DCEMP is provided as **Technical Appendix A3.1.** This sets out SPR's standard outline requirements for inclusion within a detailed DCEMP including guidance and best practice for adoption during the decommissioning and construction phases of the Development. The Outline DCEMP provides an overview of the environmental management and decommissioning and construction best practice designed to reduce the potential for any environmental effects during these phases.

81. To ensure that the mitigation and management measures detailed within this ES are carried out, construction personnel and contractors will be required to adhere to the DCEMP which will form an overarching document for all decommissioning and construction site management requirements.

82. Contractors will also be required to adhere to the following to minimise environmental effects of the decommissioning and construction process:

- Conditions required under the Consent;
- Requirements of statutory consultees including the Department of Agriculture, Environment and Rural Affairs (DAERA) and the Council;
- Any other relevant mitigation measures identified in **Chapter 15: Summary of Effects and Mitigation**, of this ES, including how the Contractor will implement this mitigation and monitor its implementation and effectiveness e.g. the control of noise and dust, and waste;
- How the contractor will respond to queries raised by members of the public; and
- How the Contractor will abide by all relevant statutory requirements and published guidelines that reflect 'good practice'.

83. The DCEMP will be agreed with the relevant statutory bodies prior to commencement of construction, and performance against the DCEMP will be monitored by the Applicant's Construction Project Manager throughout the decommissioning and construction phases.

84. Particular environmental impacts and associated mitigation measures required to be addressed within the DCEMP are discussed in the relevant sections of this ES. Such as:

- Noise and vibration;
- Dust and air pollution;
- Surface water and groundwater;
- Ecology and ornithology (including the protection of habitats and species);
- Cultural heritage;
- Waste, pollution and incidence response; and
- Site operations, including working hours and health and safety onsite.

85. The DCEMP will work in conjunction with other documents produced prior to construction, whereby there will also be a requirement to manage other aspects of the Development such as the movement of traffic, to and from the site, including for the movement of abnormal loads and daily workers commute, including mitigation for impacts to public transport and local private access arrangements.

3.9 Operational Phase

86. No time limit on the operational lifespan of the Development has been assumed for the purposes of this assessment.

3.9.1 Turbine and Infrastructure Maintenance

87. Turbine maintenance will be carried out in accordance with the manufacturer's specification. The following routine turbine maintenance will be undertaken:

- Initial service;
- Routine maintenance and servicing;
- Gearbox oil changes;
- Blade, gearbox and generator inspections; and
- Replacement of blades and components as required.

88. Operational site inspections will be undertaken by the Applicant's staff, on a weekly basis and the servicing of turbines will be undertaken as per the turbine manufacturers requirements, usually once per year, but with monthly visits by the manufacturer's servicing team.

89. Ongoing track maintenance will be undertaken to ensure safe access is maintained to all parts of the Development all year round.

90. In common with the wind turbines the Energy Storage Unit will be designed to operate remotely, and only rare maintenance visits would be required once operational.

91. It is expected that the Development will continue to employ approximately 2 or 3 people on a permanent basis, for regular operational and maintenance activities.

3.10 Decommissioning

92. In the event that the Development requires to be decommissioned, the process would be similar to the decommissioning of the Operational Corkey Windfarm. Given the fewer number of turbines, the potential effects arising from such decommissioning will be less than the effects arising as a result of the combined initial decommissioning and construction phases described above. These phases combined therefore represent the worst-case parameters for assessment purposes.

4 Site Selection and Alternative Layouts

4.1 Introduction

1. This chapter of the Environmental Statement (ES) contains a description of the site selection process and design iterations that were undertaken, arriving at the final design of the Development (**Figure 3.2**) which is described in detail in **Chapter 3: Development Description**.

2. This chapter contains the following sections:

- Site Selection Process;
- Do Nothing Scenario;
- Development Brief;
- Development Design Strategy;
- Key Environmental Design Considerations;
- The Design Iteration Process; and
- Summary.

3. A glossary of common acronyms used throughout this ES can be found in **Chapter 1: Introduction**, **Table 1.4**.

4.2 Site Selection Process

4. The Site was considered appropriate for the following reasons:

- The Site already contains the Operational Corkey Windfarm which was constructed in 1994 and is one of the first windfarms developed in the UK. From the wind data collated to date, the Site has proven to have good average wind speeds and generation capacity;
- The existing technology is no longer state-of-the-art, and modern wind turbines are capable of producing more power from a fewer number of turbines (e.g. the Operational Corkey Windfarm has ten turbines with a total installed capacity of five MW, compared to the Development's proposed five turbines and a total installed capacity of around 20 MW);
- Repowering the Operational Corkey Windfarm increases renewable energy generation capacity (by around 15 MW in this case), and with a focus on utilising as much of the existing infrastructure as possible. This results in a development with fewer environmental effects compared to a similar development on a new, greenfield site, particularly considering effects on landscape/visual receptors and peat;
- It is a location in which a development can accord with the principles set out in Energy Policy in relation to the need for renewable energy as described in **Chapter 1: Introduction**;
- There are no statutory nature conservation designations within, the Site Boundary, although the Site lies to the west of an AONB;
- The Applicant has collated an extensive database of information in relation to the Site and its environs through their experience of managing the Operational Corkey Windfarm. This existing information has been utilised during the Development design process. The information collected has allowed the Applicant to consider the use of alternative compatible technologies to improve the overall power output of the Site, such as the energy storage aspect of the Development;
- Alongside the generation of renewable energy, agriculture, such as sheep farming is the other principal land use, the use of the Site as a windfarm is and will continue to be a compatible use;
- There is an existing access track serving the Operational Corkey Windfarm, with limited areas requiring realignment;
- Can positively contribute towards regional and national renewable energy targets; and
- Can provide a series of significant social and economic benefits for the local and regional area.

4.3 'Do Nothing' Scenario

5. If the Development was not to proceed, the Operational Corkey Windfarm would continue to operate as it does at present, with a generation capacity of 5 MW. The Operational Corkey Windfarm is consented in perpetuity and for the purposes of the baseline scenario it is assumed that the windfarm would continue to operate and be maintained under its current management systems. The environmental baseline conditions will not remain static for the lifetime of the Development.

6. In addition to any changes arising from economic and agricultural policies and economic market conditions, it is predicted that biodiversity and the landscape are likely to undergo some level of change, as a result of climate change.

7. Owing to the complexities and uncertainties inherent in attempting to predict the nature and extent of such changes to landscape and biodiversity during the lifetime of the Development it has been assumed that the current baseline will persist. It is considered that this represents a precautionary and appropriate approach for EIA purposes.

4.4 Development Brief

8. The purpose of a windfarm development is to harness the power in the wind to generate electricity. The rationale is therefore to locate windfarms in areas exposed to high wind speeds, with turbines arranged in an optimum formation, maximising efficiency and energy output. However, this rationale alone does not take into account the potential environmental effects of a windfarm. The design of a windfarm must therefore be a balance between achieving an acceptable level of environmental effects whilst maximising energy yield.

9. The development brief also includes the installation of an Energy Storage Unit (further details are provided in **Chapter 3: Development Description**.

10. The development brief is therefore to design a repowered windfarm including an Energy Storage Unit, representing an optimum fit within the technical and environmental parameters of the Site, whilst maximising the use of existing infrastructure.

4.5 Development Design Strategy

11. Current best practice guidance provides a framework for the consideration of key design issues, including turbine size, layout composition, windfarm design in relation to landscape character and designing for multiple windfarms is set out in the following documents:

- The Northern Ireland Environment Agency (2010). Wind Energy Development in Northern Ireland's Landscapes[1];
- Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy[2];
- Northern Ireland Environment Agency (NIEA) (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18: Renewable Energy[3];
- Scottish Natural Heritage (SNH) (2017). Siting and Designing Windfarms in the Landscape[4].

12. The following principles were adopted which in turn informed the design iterations to ensure that the final design of the Development was the most suitable for the Site:

- The avoidance of inconsistent turbine spacing leading to relatively large gaps, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array from key views. The distance between turbines is usually a function of rotor diameter and prevailing wind direction;
- Achieving an appropriate scale of turbine, taking account of the landscape context;
- The maintenance of turbine manufacturers recommended spacing between turbines in order to minimise turbulence and turbine fatigue, leading to reductions in energy yield, taking account of the prevailing wind direction for a site;
- The utilisation of existing infrastructure, reuse of existing access roads and utilisation of the same general area/footprint of the Operational Corkey Windfarm;
- Understanding and respecting the ground conditions and topography of the Site, taking account of turbine manufacturer's specifications;
- Maximising the separation from residential dwellings; and

[1] Department of Agriculture, Environment and Rural Affairs (2010). Wind Energy Development in Northern Ireland's Landscapes
[2] Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy.
[3] Northern Ireland Environment Agency's (NIEA) Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance (SPG) to accompany Planning Policy Statement 18 Renewable Energy.
[4] Scottish Natural Heritage (2017). Siting and Designing Windfarms in the Landscape.

- Respecting other environmental constraints and associated buffers. The Indicative Developable Area shown in **Figure 4.1** is based on an initial desk based assessment of these other known constraints.

13. The identification of environmental effects is an iterative process, running in tandem with the windfarm design process. An analysis of the key design considerations for each technical discipline is given in **Section 4.6** of this Chapter. The layout of the Development has undergone a series of design iterations to avoid or reduce potential environmental effects, (**Figure 4.2**). This process has resulted in the final layout presented and assessed in this ES (**Figure 3.2 and Figure 4.2**) which represents the optimum fit within technical and environmental parameters considered.

14. In addition to the turbine locations, the other elements of the Development as shown in **Figure 3.2** which have been designed to minimise environmental effects include access tracks, the substation compound including the co-location of the Energy Storage Units, crane hardstanding areas and temporary construction compounds. The environmental effects of these elements have been minimised through the reuse of existing infrastructure where possible, careful design, siting infrastructure away from residential properties, routing of new access tracks to avoid areas of active peat and best practice construction methods as illustrated by **Figure 3.3.**

4.6 Key Environmental Design Considerations

15. The specific environmental factors considered in the design of the Development are set out in this section for each technical discipline, with their influence on the design discussed.

4.6.1 Landscape and Visual

16. Landscape and visual effects have been a key consideration in the design of the Development taking account of turbine positioning and scale, and in this case visual integration with the neighbouring operational Gruig Windfarm has been a consideration. This has been achieved through the identification of a number of key visual receptors/viewpoints.

4.6.1.1 Design Viewpoints

17. In order to achieve this, a number of the key viewpoints were selected as design viewpoints, against which to test wirelines for each turbine layout option. Design viewpoints have been selected based on an understanding of where the Development would be visible from, where static views will be gained, such as popular hilltops, or where there is a particular concentration of residential properties. The design viewpoints that were selected and agreed during pre-application discussions with the Council are as follows:

- ES Viewpoint 1: Drumrankin;
- ES Viewpoint 2: Lislaban;
- ES Viewpoint 3: Reservoir Road;
- ES Viewpoint 4: Loughgiel ;
- ES Viewpoint 5: Altnahinch Road south;
- ES Viewpoint 6: Altnahinch Reservoir;
- ES Viewpoint 7: Slieveanorra; and
- ES Viewpoint 11: Ballymeany.

4.6.1.2 Design Principles

18. The landscape and visual design objectives are as follows:

- To consider the latest wind turbine technology available, larger rotor sizes and turbine hub heights to arrive at a turbine tip height considered appropriate for the Site;
- To create a visually legible design, taking account of other environmental and technical issues and constraints where relevant, and create a simple, positive layout, viewed consistently from different positions;
- To ensure that the views of the Development from the Antrim Coast and Glens AONB, in particular those from Viewpoint 7: Slieveanorra, appear legible and the turbines relate well to the landform and each other;
- To create a compact scheme which relates to the underlying landform, with turbines laid out to extend along the ridgeline created by Slievenahanaghan Hill;
- To re-use sections of the existing access track into Operational Corkey Windfarm, minimising the need for additional tracks;
- To group turbines to create a balanced and coherent image, avoiding where possible ‘stacking’ or overlapping of turbine rotors in lines, favouring an evenly spaced and elevated group, that reflects the nature of the undulating landscape;
- To site buildings within low lying areas that are on the less visible south-west side of Slievenahanaghan Hill; and
- To group the infrastructure in order to limit the number of areas affected.

19. The iterative design process has refined the original layout to achieve the optimum design and scale of turbine for the Development, helping avoid and mitigate effects on the landscape and visual receptors where ever possible. A key consideration has been potential effects on the Antrim Coast and Glens AONB, and the views from the nearby minor roads and rural settlements. Environmental constraints, relating to areas with special sensitivities in respect of hydrology and peat, as well as constraints of gradient and set back from the existing Gruig turbines, and residential properties have been taken into account in the design iterations, and this has resulted in the identification of areas where wind turbines and other associated site infrastructure should not be located.

4.6.2 Hydrology, Hydrogeology, Geology, Soils and Peat

20. During the Environmental Impact Assessment (EIA) process, a desktop and site-based survey was carried out to inspect and identify all water features with the potential to be substantially affected. The aim of the design process was to achieve a layout that avoids effects on hydrological sensitive receptors. During design the following hydrological design principles were applied where possible:

- Avoid areas of peat;
- Minimise watercourse crossings;
- Aim to achieve a separation distance of 50 m between construction activity and watercourses (natural) mapped at a 1:50,000 scale, and a separation distance of 20 m for anthropogenic drains and smaller natural watercourses not featured on published mapping;
- Avoid more hydrologically sensitive parts of the Site; and
- Utilise existing infrastructure such as access tracks where possible.

4.6.3 Peat Depth and Stability

21. Peat has been considered to be the key design constraint within the Site, both from an ecological and the closely linked hydrological design objectives. Peat is present at varying depths in various locations within the Site. Peat represents a store of carbon, and can support (and be supported by) bog vegetation on its surface; these are valued habitats, as described in **Section 4.6.4**. Where possible, areas of active peat have been avoided and where this has not been possible, the area has been minimised to for example focusing on the localised widening of the existing track and hard stands to enable the delivery and erection of the larger turbine components. There has been continuous engagement with NIEA, throughout the design process including a site visit.

22. Peat slide is not a substantial risk at the Site at the locations considered for Development components, and hence peat slide risk was not a major factor in the design of the Development layout.

4.6.4 Ecology and Fisheries

23. In recognition of the high importance afforded to active peatland in the Department of the Environment's ‘*Planning Policy Statement 18: Renewable Energy’* (2012) and the ‘*Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development*’ (2015, under review), additional assessments were undertaken for any habitats that may qualify as 'active peat'.

24. It is acknowledged that the classification of active peat habitats can be quite complex, particularly in disturbed habitats and around the margins of peatland bodies, so a bespoke classification system has been developed for this Development, in order to provide a systematic and transparent approach as described in **Chapter 8: Ecology and Fisheries.** As discussed in **Section 4.6.3** the project team have worked closely with NIEA, including undertaking a site visit, to consider the various access track and hard standing options for example the access track configuration to T2, and to discuss areas of the Site where previously degraded peat around infrastructure that would become redundant, would have the potential to be regenerated, through habitat management. Avoidance of these sensitive habitats was a key influence on selecting turbine locations and the alignment of access tracks.

4.6.5 Ornithology

25. Potential ornithological constraints to the design of the Development were identified from the baseline surveys and assessment and the objective in the design process was to avoid or minimise these effects:

- Disturbance and displacement to breeding birds; and
- Collision risk during operation.

26. The key ornithological receptors are defined as species occurring within the zone of influence of the development upon which likely significant effects are anticipated and assessed (500 m, 800 m, 2 km and 5 km). The zones of influence for individual ornithological receptors refers to the area within which potential effects are anticipated.

27. Baseline field surveys were carried out between March 2014 and March 2019 and consisted of site walkovers and vantage point surveys during both breeding and non-breeding seasons.

28. The majority of key target breeding species as described in **Chapter 9: Ornithology**, have been avoided by applying appropriate buffers. No priority raptor species occur within 500m of either the existing or the proposed turbines although both buzzard and peregrine were recorded within 500m of the existing and/or proposed access tracks. There are no potential significant displacement or disturbance effects predicted to arise to any breeding raptor species. Snipe and red grouse territories do occur within the Site Boundary. For all snipe recorded the proposed turbines are on average further away from snipe territories than existing turbines

29. Key potential effects on birds that were specifically accounted for in the design of the Development relate to the route selection of the access track service T2.The presence of a snipe territory in close proximity to one of the options was a key consideration, which resulted in the alternative route being selected.

30. The proposed habitat management and restoration measures outlined in **Technical Appendix A3. 2: Draft HMP**, habitats will help maintain the snipe population and could also have potential beneficial effects on curlew, snipe and red grouse.

4.6.6 Noise

31. A key factor in the initial selection of the Site was the distance that could be achieved between properties, turbines and the Energy Storage Units to minimise the effects of noise from the Development. With regard to the wind turbines, the closest residential properties are the three properties located on Reservoir Road, while all other properties and the settlement of Corkey lie beyond the predicted 35 dB noise contour plot and are unlikely to be significantly affected by noise from the Development.

32. It is of critical importance that the layout of turbines, using a candidate turbine model which represents the range of turbine models, which are being considered for the Development, can meet the noise limit requirements of ETSU-R-97 and the Good Practice Guide, published by the Institute of Acoustics at every residential property. Noise was therefore an important consideration in each design iteration.

33. The Energy Storage Units emit relatively low levels of noise, and have been located as far from residential properties as it practicable (approximately 800 m from the closest residential dwelling). Given this, there is no reasonable prospect of a significant effect.

4.6.7 Archaeology and Cultural Heritage

34. A desk-based assessment and archaeological walkover was undertaken as part of the EIA. There are no known designated cultural heritage features within the Site and no significant indirect effects likely upon features in the surrounding historic environment from the Development. As such, cultural heritage features formed little constraint in terms of layout evolution.

4.7 The Design Iteration Process

35. The layout of the Development has evolved throughout the EIA process. This iterative approach has allowed the findings of the public consultation exercise, along with the EIA, to guide the evolution of the Development and has allowed the design to be modified in order to avoid and mitigate against environmental effects where possible. This process led to the Design Principles set out in **Section 4.6.1.2**.

36. This was achieved through preliminary assessments of the environmental effects, consideration of the identified spatial constraints combined with consideration of the appearance of the Development from the design viewpoints to take account of landscape and visual considerations. Two design workshops involving the project team were held to inform the design process:

- The first workshop was held at the beginning of the process to inform the initial design based on constraints known at the time and based on likely turbine heights and dimensions. This resulted in the layout on which the first round of public consultation was based; and
- The second workshop followed receipt of the Scoping Opinion, the completion of sufficient baseline survey data, and the gathering of 12 months of new wind data. This workshop informed the '"interim design freeze" layout.

37. Following the interim design freeze, further ground condition survey work was undertaken with particular regard to peat, in order to locate the turbines in areas where peat depths were shallow, the peat is not classified as active wherever possible, and to consider and inform any micro siting tolerance allowance requested. The ability to micro site will allow for the further avoidance /mitigation at the time of construction, of any localised effects which might only become apparent during the decommissioning and construction phases.

38. Following completion of the ground condition survey work, the layout was adjusted and the final layout presented in **Figure 4.2** was reached.

4.8 Layout Evolution

39. The initial layouts considered turbines up to a maximum of 150 metres (m) to blade tip. Following the analysis of the layouts against the landform, tip heights of this size were deemed too great for this Site.

40. For the purposes of Scoping, indicative 135 m turbine tip heights were referred too. Subsequent design workshops, together with consideration of the latest wind turbine technology, and further landscape and visual assessment, have informed a final decision on a turbine tip height of up to 137 m. This tip height is considered to be appropriate for this Site.

41. Turbine dimensions have also been a consideration taking account of the visual relationship of the Development with the adjacent Gruig Windfarm, as well as the surrounding landform and landscape. Gruig Windfarm lies to the immediate south of Corkey Windfarm and comprises of turbines of 100m to blade tip, it is clear that the pattern of turbine development over time has changed and that these larger turbines already represent, and give rise to scale comparisons with the Operational Corkey Windfarm. In any event the baseline context features of Gruig have also informed the final choice of tip height of up to 137 m.

42. It is also important to note that the most suitable turbine model for a particular location can change with time, and as a result of developments in wind turbine technology, and therefore, a final choice of turbine for the Development has not yet been made, although the turbine parameters described in **Chapter 3: Project Description** would not be exceeded.

4.8.1 Layout 1 (1st Round Public Consultation Layout)

43. Layout 1 was initially informed by landownership boundaries. Constraints were then identified from preliminary site surveys, the ongoing bird surveys and desk-study information, primarily from Ordnance Survey of Northern Ireland (OSNI) mapping, and included the following parameters:

- Minimum 60 m oversail buffer of the Site Boundary;
- Minimum 50 m buffer of watercourses that could be identified on the 1:50,000 OSNI map;
- Minimum 20 m buffer around natural drains;
- Minimum 50 m buffer of public roads, which represented the topple height of the turbines plus 10%;
- Minimum An exclusion of areas likely to be active peat;
- Minimum 750 m buffer for residential properties, to minimise potential noise effects and ensure that turbines are located sufficiently far from properties, so as not to appear dominant in views; and
- Areas where the topography of the ground represented a slope greater than 20%, which have the potential to give rise to technical constraints for access, and construction on steep slopes.

44. Bird surveys were also underway, and although not complete, the preliminary information provided, identified no constraints at this stage.

45. The first phase of peat probing undertaken, consisted of a 50 m grid across the Site to gain a reasonable level of understanding of the depth and nature of the peat present.

46. The minimum desirable distance between wind turbines and occupied buildings is calculated on the basis of expected noise levels and likely visual impacts, this distance will be greater than that necessary to meet safety requirements. Topple distance

(i.e. the height of the turbine to the tip of the blade) plus 10% is often used to inform what would be considered to be a minimum safe separation distance from occupied buildings. Taking account of these factors a buffer distance of 750m around residential dwellings was utilised at this stage of the design process.

47. These constraints were mapped and appropriate turbine technical spacing (4 x 6 rotor diameters between the turbines) was applied to ensure minimum overlap taking into account the predominant south-westerly wind direction. This resulted in the five turbine layout presented in Layout 1 (see **Figure 4.2**). This layout was also used to inform the first round of Public Consultation events held in August 2017.

4.8.1.1 Infrastructure Iterations

48. The presence of peat within the Site on the summit of Corkey Hill has been a key design constraint, particularly with regard to accessing the turbine positions. The overarching design aim has been to minimise the amount of new track required as far as reasonably practical by re-using the existing tracks where possible.

49. Infrastructure iterations 1 and 2 show no change in turbine positions, these infrastructure iterations demonstrate the continual refinement of the access tracks as a result of peat probing and assessment. **Figure 4.2** shows the evolution of the track layout.

4.8.1.1.1 Infrastructure Iteration 1

50. The first infrastructure iteration shows the initial access track concept, which was designed to link the Development turbine positions. At this stage, the continued use of the existing track was uncertain due to the steepness of the slope, potential widening requirements, and legal considerations, potential alternatives were therefore investigated. This is shown in **Figure 4.2**.

4.8.1.1.2 Infrastructure Iteration 2

51. The second infrastructure iteration shown in **Figure 4.2** demonstrates the options considered for gaining access to T1. A second phase of peat probing was undertaken around all turbine locations in order to determine the suitability of the locations selected in terms of peat depths and active peat. It was concluded that by utilising the existing turbine laydown and crane hardstanding in this particular area, would provide a more suitable area in which a turbine could be located. In addition the three access track options considered, were also assessed for suitability and peat depth, as a result it was concluded that utilising the existing track with localised widening on the corners, as agreed with NIEA, was the most appropriate route to T1.

4.8.1.2 Layout 2 (Interim Design Freeze Layout)

52. Layout 2 aimed to avoid or mitigate by design as many of the environmental sensitivities as possible to achieve an acceptable balance between environmental and technical considerations. This considered the first two phases of peat probing, updated ornithology surveys, ecology surveys and the landscape and visual assessment design principles. The following changes were made:

- T1 was relocated further west in order to reuse an existing crane hardstanding and laydown area;
- A further two access options serving T1 were identified and subject to further analysis regarding active peat and peat depths;
- T2 was relocated slightly west, away from an area of deeper peat. This move also relocated the turbine to a position further away from the gully and watercourse present in this part of the Site;
- Two access options to T2 were considered, in relation to gradients, due to the presence of peat and ornithological sensitivities; and
- T3 was relocated slightly eastwards in order to reduce the volume of cut and fill required for construction purposes.

53. Layout 2 is shown in **Figure 4.2**.

4.8.1.3 Layout 3 (the Final Layout)

54. The Final Layout was designed following further peat probing and 3-D analysis of the Development infrastructure in order to ensure that effects on peat, and in particular active peat and valued habitats, were minimised. The final selection of the route of the access track to serve T1 and T2 was made following on-site consultations including NIEA. The Final Layout is shown in **Figure 4.2**, for comparison with the other layout iterations.

55. Given the constraint active peat has the potential to pose regarding location of infrastructure, ongoing consultation with the NIEA throughout the full design process has been important.

56. As described in **Chapter 14: Other Issues**, the final design of the Development has also been assessed by experienced 3rd Party risk assessors, provided in **Technical Appendix 14.2**. The analysis considers the risk of blade fragmentation, or blade throw resulting from a number of different turbine failure scenarios in line with recognised methodologies and guidance supported by the Health and Safety Executive (HSE). Any risk to individuals, or multiple persons, using the Site regularly, such as maintenance workers, recreational users, road users, occupants of neighbouring properties were considered and risk levels to these receptors are well within the “Broadly Acceptable” range, which is the lowest category of risk defined by HSE guidance, and additional risk reduction measures are not required.

57. To provide further context, the risks identified by this assessment, taking account of the final layout, are in the same order of magnitude as those associated with lightning strikes (with the risk of 1 in 18,700,000 fatalities per year).

4.8.2 Infrastructure Design Evolution

4.8.2.1 Access Tracks

58. A new track to access the Operational Corkey Windfarm has recently been constructed, which reused a lot of existing agricultural track infrastructure, and the traffic accessing the Development will utilise the same track with minor alterations as a result of the need to accommodate larger turbine geometry.

59. The route of the track was selected to minimise effects on the residents of Corkey village by accessing the Development from Reservoir Road with turbine delivery vehicles approaching from the east, thus avoiding the more populated areas. A new junction to Reservoir Road is required to the west of the current junction, due to the geometry of the larger turbine components being unable to utilise the current junction, and this will then follow the line of the initial section of the operational access track. **Figure 3.3** provides a comparison between the Development layout and the Operational Corkey Windfarm layout, demonstrating the extent to which the existing track is re-used. The new junction position provides suitable visibility splays for vehicles entering and leaving the Site, and relocates the Site entrance away from residential properties to further minimise disturbance.

60. The amount of new access track required has been kept to a minimum by reusing the existing access tracks for the Operational Corkey Windfarm wherever possible as shown in **Figure 3.3**. This has helped minimise the environmental effects. Where new access tracks are required to access the Development turbines, these have been designed in a similar way to the existing tracks, avoiding localised peat deposits where possible and located within the less sensitive habitats.

4.8.2.2 Temporary Decommissioning and Construction Compounds

61. Three temporary decommissioning and construction compounds/laydown areas are required for the Development during the initial decommissioning and construction phases. The locations of the compounds have been selected to minimise environmental effects, with one of the construction compounds proposed to be located on previously disturbed ground**.** Relatively level areas of the Site have been chosen, with one located closer to the Site entrance in order to control decommissioning and construction traffic entering and leaving the Site, with a larger compound located on low lying land at an appropriate distance from residential properties to minimise disturbance from these activities, and both respecting separation distances from any identified environmental constraints, in line with the Design Principles set out in **Section 4.6**.

4.8.2.3 Substation Compound and Energy Storage Unit

62. The location of the substation compound and Energy Storage Unit is driven by a number of factors, including:

- The likely grid connection point;
- A location between the Site entrance and the wind turbines, to allow for access controls and security during the operational phase of the Development;
- Located beyond topple distance from the Development turbine positions taking account of the health and safety of site operatives during the operational phases of the Development; and
- Maximising the separation distance from residential properties so as to avoid any exceedances of the recognised noise limits as covered within **Chapter 10: Noise**.

63. By constructing the new substation in a low-lying and visually enclosed position, potential environmental effects would be minimised. By locating the Energy Storage Unit alongside the substation, the footprint of the Development is minimised and

the Energy Storage Units are seen in the context of other Development infrastructure. These aspects are in line with the Design Principles set out in **Section 4.6**.

4.9 Summary

64. The final Development layout has been informed by a robust design iteration process, achieving a layout which balances the various economic, technical and environmental constraints, and requirements, whilst achieving a best fit design for the Site, which respects the landform and considers its position adjacent to Gruig Windfarm.

65. Throughout the design process, there were three main design iterations, informed by baseline data, review of visualisations from key design viewpoints, the results of ongoing impact assessment, wind yield optimisation and taking cognisance of best practice guidance and consultation.

66. The final Development layout, and its scale has been designed to maximise renewable energy generation from the Site, whilst minimising any resulting environmental effects to an acceptable level. The ES is based on the final development layout presented in **Figure 3.2** and described in detail in **Chapter 3: Development Description**.

5 Planning

5.1 Introduction

1. This chapter describes the legislative planning and policy background to the application. The legislative basis for a decision by Causeway Coast & Glens Borough Council (the Council) is set out, and an overview of planning policy at a local level and at a regional level is provided. The chapter also identifies other material considerations that will inform the planning application determination process. This chapter does not assess the accordance of the Development against planning policy, a separate Planning Statement has been prepared to support the application and should be referred to for a detailed planning policy appraisal.

2. A glossary of common acronyms used throughout this ES can be found in Chapter 1: Introduction, Table 1.4.

3. In 2010, the Department for Enterprise, Trade and Investment (DETI) published the Strategic Energy Framework (SEF)1 which detailed NI's energy future over the next ten years and set the renewable electricity targets for 2020, identifying that 40% of electrical energy supply needs to be sourced from renewables by 2020.

4. The 2010 SEF notes that electricity generated by onshore windfarms is the most established large-scale source of renewable energy in Northern Ireland. It also states that onshore windfarms will play a vital role in meeting the new renewable electricity target.

5. The Northern Ireland Investment Strategy 2011-20212 highlights the importance of renewable sources in electricity generation. The long-term targets are emphasised, underlining that the UK Climate Change Act 2008 legislated for an 80% mandatory cut in the UK's carbon emissions by 2050 (compared to 1990 levels), with a target of 35% by 2025.

6. The Onshore Renewable Energy Action Plan 2013-20203 considers the contribution of onshore renewable technologies to the 40% renewable energy target by 2020 and recognises the impact that onshore wind has on the electricity network in Northern Ireland.

7. The Development, which will have an output of around 20 MW will contribute towards meeting the Northern Irish renewable targets through the repowering of the Operational Corkey Windfarm and will result in an increased overall generating capacity, as well as securing continuity of renewable energy provision.

5.2 Planning Legislative Context

8. **Table 5.1** outlines the Northern Ireland planning legislative context (primary legislation and subordinate legislation) for the Development. Subject to the provisions of Part 25(1)(b) of the Planning Act (Northern Ireland) 2011 and the 'Schedule'- Major Threshold Developments of 'The Planning (Development Management) Regulations (Northern Ireland) 2015', the Development is considered a 'major development' but not 'regionally significant.' since it falls below the 30MW 'regionally significant' threshold. Therefore, the Application is submitted to Causeway Coast & Glens Borough Council for determination.

Table 5.1: Northern Ireland Planning Legislation Context

Northern Ireland Planning Legislation	
Primary Legislation	
The Planning Act (Northern Ireland) 2011	The Planning Act (NI) 2011 Act provides the legislative basis for the Northern Ireland planning system including the development management systems, development plan preparation, planning appeals and enforcement and the way in which these functions are delivered.
Subordinate Legislation	
The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017	The legislative framework for EIA is set out by the EIA Directive (European Directive 2014/52/EU²). The requirements of the EIA Directive in NI are transposed by the Planning (Environmental Impact Assessment) Regulations (NI) 2017 (the EIA Regulations). The EIA Directive aims to ensure that a planning authority granting planning permission for a development proposal makes its decision with the full knowledge of any likely significant effects on the environment by setting out a procedure known as environmental impact assessment to assess such effects.
The Planning (General Development Procedure) Order 2015 (as amended 2016)	The main purpose of the Planning (General Development Procedure) Order 2015 (as amended 2016) is to transfer the necessary powers required to operate the planning system (previously contained within the Planning (General Development) Order 1993) to the councils in Northern Ireland. It also introduces some new provisions, namely: • Design and Access Statements for major applications; • Non-material changes to a previous grant of planning permission: • Publicity of applications for planning permission; and • Changes to the statutory consultation process.
The Planning (Development Management) Regulations (Northern Ireland) 2015	The Planning (Development Management) Regulations (NI) 2015 sets out the details of key elements of the development management process in relation to the new hierarchy of development, pre-application community consultation, pre-determination hearings and schemes of delegation, while also making a transitional provision.
The Planning (Fees) Regulations (Northern Ireland) 2015 (as amended)	The effect of the Planning (Fees) Regulations (NI) (as amended) is to provide for the charging of a fee for the processing of a planning application.

5.2.1 The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017

9. The Development is classified as 'Schedule 2' development as detailed in the EIA Regulations 2017. The Environmental Statement is informed by an EIA Scoping Response (**Technical Appendix 2.1: Scoping Report** and **Technical Appendix 2.2: Scoping Opinion**) provided by the Council (EIA Scoping Reference No.LA01/2017/1084/DETEIA) as per the provisions of 'The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.'

5.3 Planning Policy Context- Northern Area Plan 2016

10. Section 45 of the Planning Act 2011 states:

> *"45.-(1) Subject to this Part and section 91(2), where an application is made for planning permission, the council or, as the case may be, the Department, in dealing with the application, must have regard to the* local development plan*, so far as material to the application, and to any other material considerations….."*

11. In this legislative context regard must be had to the Northern Area Plan 2016. The Northern Area Plan 2016 (NAP 2016) is the current statutory Local Development Plan (LDP) for the Council area. The NAP 2016 comprises:

- Volume 1- Plan Strategy & Framework; and
- Volume 2- Proposals.

12. Volume 1 Plan Strategy & Framework sets out the background to the preparation of the Plan, defines its Aim, Objectives and Plan Strategy, and, with reference to the regional policy context, sets out the Strategic Plan Framework comprising

[1] Department of Enterprise, Trade and Investment (2010). Strategic Energy Framework. Available online at: https://www.economy-ni.gov.uk/publications/energy-strategic-framework-northern-ireland [Accessed on 07/07/2017]
[2] Northern Ireland Executive (2015). Investment Strategy for Northern Ireland 2011 – 2021. Available online at: https://www.infrastructure-ni.gov.uk/publications/investment-strategy-northern-ireland-2011-2021 [Accessed on 07/07/2017]
[3] Department of Enterprise, Trade and Investment (2013). Onshore Renewable Electricity Action Plan. Available online at: https://www.economy-ni.gov.uk/articles/onshore-renewable-electricity-action-plan [Accessed on 07/07/2017]

allocations, policies, and designations relating to the Plan Area as a whole. Despite the relative recent adoption date of the NAP 2016 in Sept 2015, the NAP 2016 has a protracted history. The draft NAP was published in July 2005 with progress delayed due to a judicial challenge in relation to its Strategic Environmental Assessment which was considered by NI High Court and the European Court of Justice. The PAC undertook the 'independent examination' of the Draft NAP in September 2010 (strategic objections) and January 2012 (site specific objections). The former Department of Environment (DoE) received the PAC report in June 2014 with the NAP 2016 being adopted in September 2015. The publication of the Draft NAP 2016 and associated adoption of the NAP 2016 policy predates the adoption of the Strategic Planning Policy Statement (SPPS) discussed at **Section 5.4.2** below.

13. The NAP 2016 does not include specific renewable energy policy provision or planning policy relating to energy storage development, however **Table 5.2** below outlines the relevant NAP 2016 planning policy of relevance to the Development.

Table 5.2 Relevant Policies from the Northern Area Plan 2016

The Northern Area Plan 2016	
Environment and Conservation	Policy ENV 2- Sites of Local Nature Conservation Importance
Open Space, Sport and Outdoor Recreation	Policy OSR 1- Public Rights of Way and Permissive Paths
Countryside and Coast	Policy COU 2- The Giant's Causeway and Causeway Coast World Heritage Site
Countryside and Coast	Policy COU 4The Distinctive Landscape Setting of the Giant's Causeway and Causeway Coast World Heritage Site

5.3.1 Northern Area Plan 2016

14. This section of the chapter provides a summary description of the relevant local development plan policies identified in **Section 5.3.2 to 5.3.9**. Policy summaries are presented under ES topic subheadings. Individual policies are not quoted in full (for full policy wording please refer to the respective NAP 2016 document).

5.3.2 Renewable Energy

15. The NAP 2016 does not have specific planning policy relating to renewable energy development proposals. Renewable energy is referenced in the context of 'Public Services & Utilities.' The 'Public Services & Utilities' section of NAP references prevailing regional planning policy, namely Planning Policy Statement 18 Renewable Energy (PPS18) as relevant to renewable energy infrastructure development. In the absence of relevant local renewable energy policy, both PPS18 and the SPPS will inform planning application material considerations.

5.3.3 Ecology, Fisheries & Ornithology

16. The NAP 2016 (Environment & Conservation) states that Planning Policy Statement 2: Planning and Nature Conservation (PPS2), sets out the current regional policy for the protection of conservation interests. Policy provision of PPS2 is discussed in **Section 5.5.3** of this chapter. The NAP references the sites protected at a European level (Special Protection Areas (SPA) and Special Areas of Conservation (SAC)) and national level (Areas of Special Scientific Interest (SSI) and Nature Reserves). The Antrim Hills SPA is located 0.8km north-east of the Development, Main Valley Bogs SAC is located 5.2km west of the Development. The Garron Plateau is located 8.2km south-east of the Development while Breen Wood SAC is located 10km to the north. The Lough Neagh & Lough Beg SPA is located approximately 40km downstream via the River Maine.

5.3.4. Landscape & Visual Amenity

17. The NAP 2016 (Countryside and Coast) states that PPS 2: Natural Heritage sets out the Department's planning policies for the conservation, protection and enhancement of our natural heritage, which is defined as '*the diversity of our habitats, species, landscapes and earth science features'.* Further planning policy relating to the protection of landscape settings is provided, however this specifically relates to the protection of the '*The Giants Causeway & the Causeway Coast World Heritage Site.'*

5.3.5 Hydrology, Hydrogeology, Geology, Soils & Peat

18. The NAP 2016 does not have specific hydrology, hydrogeology, geology or soils and peat planning policy. Therefore, the regional planning policy documents outlined at **Section 5.5.5**, namely the SPPS, PPS2, PPS18 and PPS15 will inform the planning application determination as material considerations.

5.3.6 Noise

19. The NAP 2016 does not include specific noise planning policy and notably there is no noise planning policy relating to renewable energy proposals. Therefore, the regional planning policy documents outlined at **Section 5.5.6**, namely the SPPS and PPS18 will inform the planning application determination as material considerations.

5.3.7 Archaeology & Built Heritage

20. The NAP 2016 states that 'Planning Policy Statement 6: Planning, Archaeology and the Built Heritage' (PPS6) and PPS 6 Addendum: 'Areas of Townscape Character' set out the current regional policy for the protection of archaeology and built heritage interests. The NAP 2016 does not contain local archaeology and built heritage policy, rather it references regional planning policy. Therefore, the regional planning policy documents outlined at **Section 5.5.7**, namely the SPPS and PPS6 will inform the planning application determination as material considerations.

5.3.8 Access, Transport & Traffic

21. The NAP 2016 states that transport and traffic planning policy is provided for by the Planning Policy Statement 3 Access, Movement and Parking (PPS 3), and Planning Policy Statement 13 Transportation & Land Use (PPS13). There is no specified transport and traffic planning policy in the LDP. Therefore, the SPPS, PPS 13 and PPS 3 should inform the planning application determination as material considerations.

5.3.9 Tourism, Recreation and Socio-Economics

22. The NAP 2016 states that Planning Policy Statement 16: Tourism (PPS 16) provides planning policy for the safeguarding of tourism assets from development likely to impact adversely upon the tourism value of the environmental asset. Furthermore, the NAP 2016 outlines that prevailing regional planning policy provides the framework for identifying appropriate development opportunities and safeguarding tourism assets from harmful development. Therefore, in the absence of specific local tourism planning policy, the planning policy provisions of the SPPS and PPS16, as outlined in **Section 5.5.9** should inform the planning application determination as material considerations. Policy OSR1 of the NAP 2016 seeks to protect the route, character, function or recreational value of the Ulster Way, the National Cycle Network, public rights of way or permissive paths and should therefore inform planning policy at local level.

5.4. Material Considerations – Regional Planning Policy & Guidance

5.4.1 Regional Planning Policy & Guidance: Regional Development Strategy for Northern Ireland 2035 (RDS)

23. The Regional Development Strategy 2035 (RDS 2035) strategic guidance actively promotes the shift to a lower carbon economy, the adaptation to climate change and the delivery of a secure and sustainable energy supply. One of the eight key aims of the RDS 2035 is to:

> *"Take action to reduce our carbon footprint and facilitate adaption to climate change."*

24. The RDS 2035 regional guidance for the economy prioritises a secure energy supply stating:

> *"RG5: Deliver a sustainable and secure energy supply."*

25. Supplementary guidance within the RDS 2035 seeks to:

- *"Increase the contribution that renewable energy can make to the overall energy mix:*
- *Strengthen the grid:*
- *Provide new gas infrastructure:*
- *Work with neighbour's:*
- *Develop "Smart Grid" Initiatives:*[4]*"*

[4] *Section 3.8, RDS 2035*

26. Regional guidance for the environment at policy RG9 prioritises the need to reduce NI's carbon footprint and the adaption of the region to climate change:

> ***"RG9:*** *Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality."*

27. The RDS 2035 notes that climate change is *"increasingly seen as one of the most serious problems facing the world"* and outlines that *"consideration needs to be given on how to reduce energy consumption and the move to more sustainable methods of energy production."* The RDS 2035 identifies climate change mitigations measures which include those to:

- *"Increase the use of renewable energies;*
- *Utilise local production of heat and/or electricity from low or zero carbon energy sources[5]"*

28. The RDS 2035 outlines key climate change adaption measures including:

- *"Re-use land, buildings and materials;*
- *Minimise development in areas at risk from flooding from rivers, the sea and surface water run-off;*
- *Protect soils;*
- *Protect and extend the ecosystems and habitats that can reduce or buffer the effects of climate change"*

5.4.2 Regional Planning Policy & Guidance: Strategic Planning Policy Statement for Northern Ireland (SPPS)

29. The SPPS is the regional planning policy document for Northern Ireland. It contains a suite of planning policy and is a material planning consideration in the assessment of all planning applications in NI.

30. Section 3.3 of the SPPS states that "planning authorities should deliver on all three pillars of sustainable development in formulating policies and plans." In terms of the environment, this is stated as :

> *"Protecting and enhancing the built and natural environment (including our heritage assets, landscape and seascape character); seeking to ensure the planning contributes to a reduction in energy and water usage, helping to reduce greenhouse gas emissions by continuing to support growth in renewable energy sources……"*

31. Section 3.7 further expounds that "*furthering sustainable development also means ensuring the planning system plays its part in supporting the Executive and wider government policy and strategies in efforts to address any existing or potential barriers to sustainable development. This includes strategies, proposals and future investment programmes for key transportation, water and sewerage, telecommunications and energy infrastructure (including the electricity network).*"

32. Section 3.13 indicates that the planning system should help to mitigate and adapt to climate change by measures which include:

- *"shaping new and existing developments in ways that reduce greenhouse gas emissions and positively build community resilience to problems such as extreme heat or flood risk;*
- *promoting sustainable patterns of development, including the sustainable reuse of historic buildings where appropriate, which reduces the need for motorised transport, encourages active travel, and facilitates travel by public transport in preference to the private car;*
- *avoiding development in areas with increased vulnerability to the effects of climate change, particularly areas at significant risk from flooding, landslip and coastal erosion and highly exposed sites at significant risk from impacts of storms;*
- *considering the energy and heat requirements of new developments when designating land for new residential, commercial and industrial development and making use of opportunities for energy and power sharing, or for decentralised or low carbon sources of heat and power wherever possible;*
- *promoting the use of energy efficient, micro-generating and decentralised renewable energy systems;*

33. Section 6.214 highlights that NI has significant renewable energy resources and a vibrant renewable energy industry while Section 6.216 states that:

> *"Renewable energy reduces our dependence on imported fossil fuels and brings diversity and security of supply to our energy infrastructure. It also helps Northern Ireland achieve its targets for reducing carbon emissions and reduces environmental damage such as that caused by acid rain. Renewable energy technologies support the wider Northern Ireland economy and also offer new opportunities for additional investment and employment, as well as benefitting our health and well being, and our quality of life."*

34. Section 6.218 outlines that the "*aim of the SPPS in relation to renewables is to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment in order to achieve Northern Ireland's renewable energy targets and to realise the benefits of renewable energy without compromising other environmental assets of acknowledged importance."*

35. Section 6.219 details the regional strategic development objectives for renewable energy which are to:

- *ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed;*
- *ensure adequate protection of the region's built, natural, and cultural heritage features; and 50 The PfG contains a target for a reduction in greenhouse gas emissions by at least 35% on 1990 levels by 2025. 91*
- *facilitate the integration of renewable energy technology into the design, siting and layout of new development and promote greater application of the principles of Passive Solar Design*

36. Regarding Local Development Plans and renewable energy, section 6.221 states:

> *"Councils should set out policies and proposals in their Local Development Plans (LDPs) that support a diverse range of renewable energy development, including the integration of micro-generation and passive solar design. LDPs must take into account the above-mentioned aim and regional strategic objectives, local circumstances, and the wider environmental, economic and social benefits of renewable energy development. Moratoria on applications for renewable energy development whilst LDPs are being prepared or updated are not appropriate*."

37. The pertinent SPPS planning policy is referenced in respect of the relevant chapters in the ES. The Planning Statement submitted as part of this planning application provides an assessment of the Development against the relevant policy provision of the SPPS.

Table 5.3: Northern Ireland Planning Policy Context – Strategic Planning Policy Statement

Strategic Planning Policy Statement for Northern Ireland 2015 (SPPS)
The Archaeology and Built Heritage section (Para 6.6- 6.27) provides planning policy on the following topics (i) world heritage sites (ii) archaeology (iii) listed buildings (iv) conservation areas (v) areas of townscape character (vi) non-designated heritage assets (vii) enabling development.
The Development in the Countryside section (Para 6.61- 6.78) provides planning policy on the following topics; (i) Residential Development and Non-residential development, (ii) Farm diversification, iii) Agricultural and forestry development, and (iv) The conversion and re-use of existing buildings for non-residential use.
The Flood Risk section (Para 6.99- 6.132) provides planning policy on; (i) Development in River (Fluvial) and Coastal Flood Plans (ii) Development at Surface Water (Pluvial) Flood Risk outside Flood Plains, (iii) Development in Proximity to Reservoirs, (iv) Protection of Flood Defence & Drainage Infrastructure, and (v) Artificial Modification of Watercourses.
The Natural Heritage section (Para 6.168- 6.198) provides planning policy on; (i) international designations, (ii) protected species, (iii) national designations including Areas of Special Scientific Interest, Nature Reserves or National Nature Reserves, Marine Conservation Zones, and (iv) Local Designations including Local Nature Reserves and Wildlife Refuges and 'Other Habitats, Species or features of National Heritage Importance

[5] *Section 3.26, RDS 2035*

Strategic Planning Policy Statement for Northern Ireland 2015 (SPPS)
The Renewable Energy section (Para 6.214- 6.234) provides planning policy on; (i) siting of renewable energy proposals within designated landscapes which include Areas of Outstanding Natural Beauty and World Heritage sites (ii) (a) impacts upon public safety, human health, or residential amenity (b) visual amenity and landscape character (c) biodiversity, nature conservation or built heritage assets (d) local natural resources, such as air quality, water quality or quantity and (e) public access to the countryside, (iii) Active Peatland, and (iv) Separation distances between windfarm development and occupied properties.
Telecommunications and other Utilities (Para 6.235- 6.250) provides planning policy in respect of the (i) impact of new telecommunications/ other utilities impact on visual amenity and on environmentally sensitive features and locations (ii) ICNIRP public exposure to electromagnetic fields (iii) protection of airport public safety zones
Tourism (Para 6.251- 6.266) provides planning policy for (i) tourism proposals within settlements (ii) tourism proposals in the countryside (iii) protection of tourism assets including built and natural heritage assets and safeguarding from unnecessary and inappropriate development.
Transportation (Para 6.293- 6.30) provides planning policy in respect of the requirements for planning applications and associated Department's published guidance namely the requirement for a Transport Assessment and inclusion of mitigation measures, where appropriate.

5.4.3 Regional Planning Policy & Guidance: Northern Ireland Planning Policy Statements

38. The suite of existing planning policy statements are material planning considerations in the determination of planning applications. There is currently a transitional period in planning policy terms that will operate until such time as the Local Development Plan 'Plan Strategy' for the Council has been adopted. During the transitional period planning authorities will apply existing retained policy (including PPSs) together with the SPPS. Relevant supplementary and best practice guidance will also continue to apply. Where a Council adopts its Plan Strategy, existing policy retained under the transitional arrangements shall cease to have effect in the district of that council and shall not be material from that date, whether the planning application has been received before or after that date.

39. Any conflict between the SPPS and any retained policy (PPS) must be resolved in favour of the provisions of the SPPS. For example, where the SPPS introduces a change of policy direction and/or provides a policy clarification that would conflict with the retained policy the SPPS should be accorded greater weight in the assessment of individual planning applications. However, where the SPPS is silent or less prescriptive on a particular planning policy matter than retained policies this should not be judged to lessen the weight afforded to the retained policy. PPS 18 and its associated best practice guidance (BPG) and supplementary planning guidance (SPG) are retained as regional planning policy.

40. Policy RE1 of PPS 18 and the SPPS differ in how they describe the weight that should be attached to the renewable energy project's wider environmental, economic and social benefits. The SPPS states that these are material considerations that will be given appropriate weight in determining whether planning permission should be granted whereas Policy RE1 states that they should be accorded significant weight. The policy provision of the SPPS should be accorded greater weight in the determination of individual wind energy planning applications.

41. **Table 5.4** below provide an overview of the Planning Policy Statements and their respective policy provision.

Table 5.4: Planning Policy Statements

Planning Policy Statements
Planning Policy Statement 2- Natural Heritage
Policy NH1 – European and Ramsar Sites – International Policy NH2 – Species Protected by Law Policy NH3 – Sites of Nature Conservation Importance - National Policy NH4 – Sites of Nature Conservation Importance - Local Policy NH5 – Habitats, Species or Features of Natural Heritage Importance
Planning Policy Statement 2- Natural Heritage
Policy NH6 – Area of Outstanding Natural Beauty
Planning Policy Statement 3 Access, Movement and Parking (PPS3, Revised 2015)
Policy AMP 1 - Creating an Accessible Environment Policy AMP 2 - Access to Public Roads Policy AMP 3 - Access to Protected Routes (as updated in PPS 3 Clarification) Policy AMP 6 - Transport Assessment Policy AMP 7 - Car Parking and Servicing Arrangements Policy AMP 8 - Cycle Provision Policy AMP 9 - Design of Car Parking Policy AMP 10 - Provision of Public and Private Car Parks Policy AMP 11 - Temporary Car Parks
Planning Policy Statement 6 - Planning, Archaeology & the Built Heritage
Policy BH1 - Preservation of Archaeological Remains of Regional Importance and their Settings Policy BH2 - The Protection of Archaeological Remains of Local Importance and their Settings Policy BH3 - Archaeological Assessment & Evaluation Policy BH4 - Archaeological Mitigation Policy BH6 - The Protection of Parks, Gardens & Demesne's of Special Historic Context Policy BH11 - Development affecting the Setting of a Listed Building
Planning Policy Statement 10 Telecommunications
Policy Tel 2 - Development and Interference with Television Broadcasting Services
Planning Policy Statement 13 Transportation & Land Use
General Principle 3 – The process of Transport Assessment. General Principle 5 - Developers should bear the cost of transport infrastructure necessitated by their development.
Planning Policy Statement 15 Planning and Flood Risk
Policy FLD1 - Development and Fluvial (River) and Coastal Flood Plains Policy FLD3 - Development and Surface Water (Pluvial) Flood Risk Outside Flood Plains Policy FLD4 – Artificial Modification of Watercourses
Planning Policy Statement 16 Tourism
Policy TSM 8 - Safeguarding of Tourism Assets
Planning Policy Statement 18 Renewable Energy
Policy RE1- Renewable Energy.
Planning Policy Statement 21- Development in the Countryside
Policy CTY 1 - Development in the Countryside Policy CTY 13 - Integration & Design of Buildings in the Countryside.

5.4.4 Regional Planning Policy & Guidance- Other Considerations

42. PPS 18 is supported by a supplementary planning guidance document entitled 'Supplementary Planning Guidance - Wind Energy Development in NI's Landscapes' (SPG). The SPG provides broad, strategic guidance in relation to the visual and landscape impacts of wind energy development. The SPG document includes general guidance on siting and design within Northern Ireland's landscapes and advice on the landscape assessment of proposed developments. The SPG is a guidance document intended to supplement planning policy (PPS18 & the SPPS).

43. PPS18 is also supported by a best practice guidance document entitled 'PPS 18 - Best Practice Guidance (BPG). Section 1.0 of the BPG provides guidance on wind energy development. The BPG is a guidance document which is supplementary to planning policy.

5.5 Regional Planning Policy & Guidance- Review

44. This section of the chapter provides a summary description of the relevant regional planning policies of relevance to the Development, identified in **Section 5.5.1 and 5.5.9** by topic. In addition, the relevant content of the SPG and BPG (referenced in **Section 5.4.4** of this chapter) are also provided. Policy summaries are presented under ES topic subheadings. Individual policies are not quoted in full (for full policy wording please refer to the respective regional planning policy documents).

5.5.1 Renewable Energy

45. SPPS planning policy outlines that renewable energy development proposals will be permitted where the proposal will not result in an unacceptable adverse impact on; (i) public safety, human health, or residential amenity, (ii) visual amenity and landscape character, (iii) biodiversity, nature or built heritage assets, (iv) local natural resources, such as air quality, water quality or quantity, and (v) public access to the countryside. The SPPS espouses a cautious approach for renewable energy proposals within designated landscapes such as AONBs and World Heritage Sites. SPPS policy states that the wider environmental, economic and social benefits of renewable energy proposals are material considerations that will be given appropriate weight in the planning application determination process. Policy also provides that renewable energy proposals will not be permitted unless there are imperative reasons of over-riding public interest as defined under 'The Conservation Regulations (NI) 1995', as amended. Regarding separation distances between windfarms and occupied properties, a separation distance of 10 times rotor diameter with a minimum distance of not less than 500m will generally apply. There is no planning policy relating to energy storage.

46. Retained PPS18 planning policy (Policy RE1) aligns with the SPPS renewable energy policy insofar as it propagates that renewable development proposals will be permitted provided the proposal will not result in an unacceptable adverse impact upon; (a) public safety, human health or residential amenity, (b) visual amenity and landscape character, (c) biodiversity, nature conservation or built heritage interests, (d) local natural resources such as air quality or water quality, and (e) public access to the countryside. Notably PPS 18 policy states that the wider environmental, economic and social benefits of renewable energy proposals will be given significant weight in the determination of planning applications. Section 1.3 of PPS 18 details that the "varied nature of renewable energy technologies presents the potential to develop an indigenous renewable energy industry" providing for a range of opportunities to support the NI economy which include; (i) direct and indirect employment opportunities, (ii) revenue to landowners, and (iii) an improved source of electricity in remote areas. As noted in paragraph 38 of this chapter the policy provision of the SPPS should be afforded greater weight in the assessment of individual wind energy planning applications, where a conflict between the SPPS and the retained PPS18.

47. Policy RE1 specifies additional provision noting that wind energy proposals will be required to demonstrate that; (i) the development will not have an unacceptable impact on visual amenity and landscape character, (ii) that the development has taken into consideration the cumulative impact of existing and approved turbines, (iii) that it will not create a significant risk of landslide or bog-burst, (iv) that no part of the development will give rise to unacceptable electromagnetic interference to communication installations, (v) that the development will not have an unacceptable impact on rails, roads or aviation safety, (vi) that the development will not cause significant harm to the safety or amenity of sensitive receptors and that (vii) above-ground redundant plant and associated infrastructure shall be removed and the site restored.

48. Policy RE1 specifies that development on active peatland will not be permitted unless there are imperative reasons of overriding public interest. This is consistent with SPPS policy. Policy RE1 recommends a separation distance of 10 times rotor diameter to occupied property with a minimum separation distance of not less than 500m between windfarms and occupied properties- will generally apply, again consistent with policy direction in the SPPS. Similarly to the SPPS, Policy RE1 does not make provision for Energy Storage.

5.5.3 Ecology, Fisheries & Ornithology

49. SPPS planning policy outlines that planning permission will only be granted for a development proposal that, either individually or in combination with existing and/or proposed plans or projects, is not likely to have a significant effect on a European site (Special Protection Area, proposed Special Protection Area, Special Areas of Conservation and Sites of Community Importance) or a listed or proposed Ramsar site. A development which could adversely affect the integrity of a European or Ramsar site may only be permitted in exceptional circumstances as laid down in relevant statutory provisions. The SPPS also details that planning permission will only be granted for a development proposal that is not likely to have an adverse effect on the integrity of 'Areas of Special Scientific Interest', 'Nature Reserves or National Nature Reserves' and ''Marine Conservation Zones.' The SPPS specifies that development proposals within AONBs must be sensitive to the distinctive special character of the area and quality of their landscape.

50. The SPPS states that planning permission will only be granted for a development proposal that is not likely to harm European protected species except in exceptional circumstances. Exceptional circumstances are defined as *'there are no alternative solutions'* and '*it is required for imperative reasons of over-riding public interest'* and *'there is no detriment to the maintenance of the population of the species at favourable conservation status'*; and '*compensatory measures are agreed and fully secured*.' SPPS policy states that planning permission will only be granted for a development proposal that is not likely to harm other statutorily protected species. The SPPS details that planning permission should only be granted for development proposals which are not likely to give rise to unacceptable adverse impact on; (i) priority habitat, (ii) priority species, (iii) active peatland, (iv) ancient and long established woodland, (v) features of earth science conservation importance, (vi) features of the landscape which are of importance for wild flora and fauna, (vii) rare or threatened native species, (viii) wetlands (including river corridors) or, (ix) other natural heritage features worthy of protection, including trees and woodland. Planning permission will only be granted for a development proposal that is not likely any other statutorily protected species and which can be adequately mitigated or compensated against.

51. PPS 2 Policy NH1: European & Ramsar Sites (International) prescribes that planning permission will only be granted for a development that is not likely to have, or in combination with existing and/or proposed plans or projects likely to have, a significant effect on a designation European site (SPA, proposed SPA, SAC, candidate SAC and Sites of Community Importance) or a listed or proposed Ramsar site. If a development proposal is likely to have significant effect or reasonable doubt remains, the Department shall make an appropriate assessment of the implications for the site in view of the site's conservation objectives. In exceptional circumstances a development which could adversely affect the integrity of a European or Ramsar site may only be permitted where there are no alternative solutions and the proposed development is required for imperative reasons of over-riding public interest and compensatory measures are agreed and fully secured. As part of the consideration of exceptional circumstances, where a European or Ramsar site hosts a priority habitat or priority species listed in Annex I or II of the Habitats Directive, a development proposal will only be permitted when it is necessary for the reasons of human health or public safety or there is a beneficial consequence of primary importance to the environment or the proposal has been agreed in advance with the European Commission.

52. PPS2 Policy NH 2: 'Species Protected by Law', outlines the policy protection for European protected species and national protected species. Planning permission will not be granted for a development proposal that is likely to harm a European protected species except in exceptional circumstances. The exceptional circumstances are defined as there being no alternative solutions, the development proposal is required for imperative reasons of over-riding public interest, there is no detriment to the maintenance of the population at favourable conservation status and compensatory measures are agreed and fully secured. Regarding national protected species, planning permission will only be granted for a development proposal where said proposal is not likely to harm the protected species and which can be adequately mitigated or compensated against.

53. PPS2 Policy NH5: 'Habitats, Species or Features of Natural Heritage Importance', outlines planning policy in respect of protected habitats and species. The policy prescribes that planning permission will only be granted for a development proposal which is not likely to result in the unacceptable adverse impact or damage to know (i) priority habitats (ii) priority species (iii) active peatland (iv) ancient and long-established woodland (v) features of earth science conservation importance (vi) features of the landscape which are of major importance for wild flora and fauna (vii) rare or threatened native species (viii) wetlands or (ix) other natural heritage features worthy of protection. A development proposal which is likely to result in an unacceptable adverse impact on, or damage to, habitats, species or features may only be permitted where the benefits of the proposed development outweigh the value of the habitat, species or feature. In such cases, appropriate mitigation and/or compensatory measures will be required.

54. Planning policy in the SPPS aligns with the policy provision in PPS2.

5.5.4. Landscape & Visual Amenity

55. The SPPS does not have specific planning policy pertaining to landscape and visual impact. Rather the landscape and visual planning policy relating to the Development is specified in Policy RE1 of PPS18 and renewable energy policy in the SPPS. The SPPS provides that renewable energy proposals will be permitted where the proposal will not result in an unacceptable adverse impact on visual amenity and landscape character. The SPPS states *"it will not necessarily be the case that the extent of visual impact or visibility of windfarm development will give rise to negative effects; windfarm developments are by their very nature highly visible yet this in itself should not preclude them as acceptable features in the landscape. The ability of the landscape to absorb development depends on careful siting, the skill of the designer, and the inherent characteristics of the landscape such as landform, ridges, hills, valleys, and vegetation."*

56. The SPPS specifies that the supplementary guidance 'Wind Energy Development in Northern Ireland's Landscapes' and other relevant practise notes should be taken into account in assessing all wind turbine proposals including the 'PPS 18 Best Practice Guidance Note.'

57. PPS 18 Policy RE1 provides that permission will not be granted for renewable energy proposal that will have an unacceptable adverse impact upon visual amenity and landscape character. Additionally, wind energy proposals will have to demonstrate that the development will not have an unacceptable impact on visual amenity or landscape character through the number, scale, size and siting of the turbines. Policy REI specifies that the supplementary planning guidance 'Wind Energy Development in Northern Ireland's Landscapes' will be taken into account in assessing all wind turbine proposals.

5.5.5 Hydrology, Hydrogeology, Geology, Soils & Peat

58. The SPPS section entitled 'Development at Surface Water (Pluvial) Flood Risk Outside Floodplains' requires that all development proposals that exceed 1 hectare will require the submission of a 'Drainage Assessment' (DA) as part of the planning application. Development requiring a DA will be permitted where it is demonstrated through the DA that adequate measures will be put in place so as to effectively mitigate the flood risk to the proposed development and from development elsewhere. Regarding the 'Artificial Modification of Watercourses', the SPPS prescribes that Planning Authorities should only permit the artificial modification of a watercourse in the exceptional circumstance where the culverting of a short length of watercourse is necessary to provide access to a development site (or part thereof), or where such operations are necessary for engineering reasons unconnected with the development proposal.

59. The SPPS (Natural Heritage) states that planning permission will only be granted which is not likely to result in an unacceptable adverse impact on 'active peatland.' The SPPS further states that development likely to result in an unacceptable adverse impact to active peatland may only be permitted where the benefits of the development outweigh the value of the 'active peatland.' In these cases, appropriate mitigation and/ or compensatory measures will be required. However, the SPPS (Renewable Energy) states that renewable energy development on active peatland will not be permitted unless there are imperative reasons of public interest as defined under 'The Conservation (Natural Habitats) Regulations (NI) 1995, as amended. Notably the renewable energy planning policy sets a stricter criterion for development than the natural heritage planning policy.

60. PPS 15 'Planning & Flood Risk', Policy FLD3' 'Development and Surface Water (Pluvial) Flood Risk Outside Flood Plains' states that all development proposals that exceed 1 hectare will require the submission of a 'Drainage Assessment' (DA) as part of the planning application. FLD 1 further states that drainage assessments will be required where surface water run-off from the development may adversely impact upon other development or features of importance to nature conservation, archaeology or the built heritage. Policy FLD4- Artificial Modification of Watercourses states that the artificial modification of a watercourse, including culverting or canalisation operations, will only be permitted in exceptional circumstances which include where the culverting of short length of a watercourse is necessary to provide access to a development site or part thereof or and where it can be demonstrated that a specific length of watercourse needs to be culverted for engineering reasons and that there are no reasonable or practicable alternative courses of action.

61. PSS18 RE1–Renewable Energy Development states that any development on active peatland will not be permitted unless there are imperative reasons of overriding public interest. PPS 2 Policy NH 5 - Habitats, Species or Features of Natural Heritage Importance provides that planning permission will only be granted for a development proposal which is not likely to result in the unacceptable adverse impact on active peatland unless the benefits of the proposed development outweigh the loss of the active peatland. This policy inconsistency between natural heritage policy and renewable energy policy aligns with the inconsistency in the SPPS.

5.5.6 Noise

62. The SPPS states that renewable energy proposals will not be permitted where the development will result in an unacceptable adverse impact upon public safety, human health or residential amenity. It further states that proposal will be assessed in accordance with normal planning criteria including noise considerations.

63. PPS 18 Policy REI states that renewable energy developments will be permitted provided that the development will not result in an unacceptable adverse impact upon, public safety, human health or residential amenity. PPS 18 further explains that wind energy developments will be required to demonstrate that the development will not cause significant harm to the safety or amenity of any sensitive receptors (including future occupants of committed developments) arising from noise, shadow flicker; ice throw; and reflected light.

64. PPS 18 Best Practice Guidance (BPG) provides further guidance on the assessment of wind energy developments and noise impact. The BPG references 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97)' as a framework for the measurement of wind farm noise and gives indicative noise levels calculated to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development. The report presents the findings of a cross-interest Noise Working Group and makes a series of recommendations that can be regarded as relevant guidance on good practice. Since the publication of ETSU-R-97 a further noise guidance was issued by the Institute of Acoustic Engineers entitled 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment & Rating of Wind Turbine Noise' which provides further detailed guidance on the application of ETSU.

5.5.7 Archaeology & Built Heritage

65. The SPPS details that scheduled monuments benefit from statutory protection under the provisions of the Historic Monuments & Archaeological Objects (NI) Order 1995. Developments which would adversely affect the integrity of scheduled monuments or the integrity of their setting will only be permitted in exceptional circumstances Development proposals which would adversely affect archaeological remains of local importance or their settings should only be permitted where the planning authority considers that the need for the proposed development or other material considerations outweigh the value of the archaeological assets or their setting. The SPPS recommends that planning authorities should seek necessary information from applicants in making well informed judgements and in the event where an applicant has failed to provide a suitable assessment/ evaluation upon request that a precautionary approach should be followed, and planning permission should be refused. Where a planning authority is minded to granted planning permission for development which will affect sites known or likely to contain archaeological remains, it should ensure that appropriate measures are taken for the identification and the mitigation of archaeological impacts of the development. Appropriate mitigation options include preservation of remains in situ, licensed excavation or recording examination and archiving of the archaeology by way of planning condition.

66. Planning applications which have the potential to impact upon listed buildings and their settings should be assessed, having regard to their intrinsic value and for their contribution to the character and quality of the settlements and the countryside. Due regard should also be paid to the rarity of the type of structure and any features of special architectural or historic interest which it possesses. The SPPS outlines that planning permission for developments that would lead to the loss of, or cause harm to, the overall character, principal components or setting of 'Historic Parks, Gardens & Demesnes' will not be permitted In assessing applications for development in or adjacent to 'Historic Parks, Gardens & Demesnes', particular account should be taken of the impact of the proposal on the archaeological, historical or botanical interest of the site.

67. PPS 6 'Planning, Archaeology & the Built Heritage' Policy BH1-'Preservation of Archaeological Remains of Regional Importance and their Setting' outlines that Development which would adversely affect scheduled monuments, or the integrity of their settings will not be permitted unless there are exceptional circumstances. In assessing the integrity of a scheduled monument Policy BH1 details the integrity of the setting as the assessment of critical views of and from the monument; the access and public approaches to the monument; and the understanding and enjoyment of the monument by visitors. Policy BH 2 - The Protection of Archaeological Remains of Local Importance' outlines that proposals which would adversely affect archaeological sites or monuments which are of local importance or their settings, will only be permitted where the Department considers the importance of the proposed development or other material considerations outweigh the value of the remains in question. Policy BH 3 - Archaeological Assessment & Evaluation, explains that if the impact of a development proposal on important archaeological remains is unclear, or the relative importance of such remains is uncertain, that the planning authority will normally require applicants to provide further information in the form of an archaeological assessment or an archaeological evaluation. Policy BH4 - Archaeological Mitigation states that where it is decided to grant planning permission for development which will affect sites known to contain archaeological remains, the Department will impose conditions to ensure that appropriate measures are taken for the identification and mitigation of the archaeological impacts of the development, including where appropriate the completion of a licensed excavation and recording of remains before development commences. Policy BH6 - The Protection of Parks, Gardens & Demesne's of Special Historic Context' outlines that planning permission will not be granted for proposals which would lead to the loss of, or cause harm to, the character, principal components or setting of parks, gardens and demesnes of special historic interest.

68. Policy BH11 - 'Development Affecting the Setting of a Listed Building' outlines that Department will not normally permit development which would adversely affect the setting of a listed building. Development proposals will normally only be considered appropriate where all the following criteria are met: (a) the detailed design respects the listed building in terms of scale, height, massing and alignment; (b) the works proposed make use of traditional or sympathetic building materials and techniques which respect those found on the building; and (c) the nature of the use proposed respects the character of the setting of the building.

69. The planning policy provisions of PPS 6 and the SPPS are consistent. PPS6 Policy BH1 provides clarification on the assessment of impact on the setting of scheduled monuments and lists the criteria to be assessed/ reviewed.

5.5.8 Access, Transport & Traffic

70. The SPPS states that in assessing development proposals, planning authorities must apply the Department's published guidance and recommends that planning authorities should require the submission of a Transport Assessment (TA) for proposals that are likely to generate a significant volume of traffic. The TA should include a full assessment of the transport impact and should include mitigation measures where appropriate.

71. PPS 13 Transportation & Land Use identifies general principles which apply to the planning and delivery of transportation and development. General Principle 3 outlines that the process of Transport Assessment (TA) should be employed to review the potential transport impacts of a development proposal. General Principle 5 outlines that developers should bear the costs of transport infrastructure necessitated by their development.

72. PPS 18- Policy RE1 outlines that all planning applications for wind energy development will be required to demonstrate that no part of the development will have an unacceptable impact on roads, rail or aviation safety.

5.5.9 Tourism, Recreation and Socio-Economics

73. The SPPS highlights the importance of built and natural heritage of Northern Ireland regarded as tourism assets, citing examples such as historical and archaeological sites, certain beaches and AONBs. SPPS planning policy states that planning permission should not be granted for development that would, in itself or in combination with existing and approved development in the locality, have an adverse impact on a tourism asset, such as to significantly compromise its tourism value. Regarding renewable energy, the SPPS outlines that renewable energy proposals will be permitted where, amongst other planning considerations, the development will not result in an unacceptable adverse impact on public access to the countryside which arguably could be interpreted as a tourism asset.

74. PPS16- Tourism Policy 'TSM 8- Safeguarding of Tourism Assets', notes that planning permission will not be granted for development that would in itself or in combination with existing and approved development in the locality have an adverse impact on a tourism asset such as to significantly compromise its tourism value. This policy provides for the safeguarding of all tourism assets, including those which are subject to protection for other reasons under other legislative or policy provision and those which are not subject to such protection. 'Tourism assets' are defined by PPS 16 as "*any feature associated with the built or natural environment which is of intrinsic interest to tourists."* PPS18 Policy RE1 states that that renewable energy proposals will be permitted where, amongst other planning considerations, the development will not result in an unacceptable adverse impact on public access to the countryside which arguably could be interpreted as a tourism asset.

75. The tourism policy provision of the SPPS and PPS16 is largely consistent. PPS 16 provides clarification on the definition of 'tourism assets' while the SPPS does not provide the same clarification.

76. The SPPS renewable energy policy states that the wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given appropriate weight in determining whether planning permission should be granted. The SPPS further states that consideration of all renewable energy proposals will take account of their contribution to the wider environmental benefits arising from a clean, secure energy supply, reductions in greenhouse gases and other polluting emissions, and contributions towards meeting Northern Ireland's target for use of renewable energy sources.

77. PPS 18- Policy RE1 states that the wider environmental, economic and social benefits of all proposals for renewable energy projects are material considerations that will be given significant weight in determining whether planning permission should be granted. PPS 18 further states that the planning authority will support renewable energy proposals unless they would have unacceptable adverse effects which are not outweighed by the local and wider environmental, economic and social benefits of the development. This includes wider benefits arising from a clean, secure energy supply; reductions in greenhouse gases and other polluting emissions; and contributions towards meeting Northern Ireland's target for use of renewable energy sources.

78. There is a policy difference between the SPPS and PPS18 in the consideration of the material weight that should be given to the wider environmental, economic and social benefit considerations in the determination of renewable energy planning applications. The SPPS specifies that 'appropriate weight' should be given to the wider environmental, economic and social benefits of all proposals, while the PPS18 states that 'significant weight' should be afforded to the same considerations.

5.6 Regional Planning Policy &Guidance: Strategic Planning Policy Statement Strategic Planning Policy Review for Onshore Renewable Energy Development

A review of planning policies on renewable energy was announced in September 2016. The strategic review is being undertaken by Element Consultants on behalf of the Department for Infrastructure (DfI). The completion of the strategic review and associated DfI recommendations have been delayed by the absence of the NI Executive. DfI Planning Policy unit advised they are not in a position to provide a timeframe for the completion of the strategic review process.

5.7 Preparation of New Local Development Plan for Causeway Coast & Glens Borough Council

79. At the time of preparation of this ES, the Council are in the process of preparing their Local Development Plan for the Council Area – Causeway Coast & Glens Local Development Plan 2030 (LDP)- refer to **Table 5.5** below for the Local Development Plan timetable (indicative). The Council published their Preferred Options Paper in Summer 2018. It is anticipated that the draft Plan Strategy will be published in Autumn / Winter 2019 with the independent examination due to take place in Spring/ Summer 2020. The target date for adoption of the Plan Strategy is Summer/ Autumn 2021.

Table 5.5: Causeway Coast & Glens Local Development Plan Indicative LDP Timetable

Causeway Coast & Glens Local Development Plan Indicative LDP Timetable	
Robust Evidence Gathering	Spring- Winter 2016
Publish Plan Timetable & Statement of Community Involvement	Winter 2016
Publish Preferred Options Paper Publish Preferred Options Paper (12 week consultation period)	Spring/Summer 2018
Publish Draft Plan Strategy (8 week consultation period)	Autumn/Winter 2019
Independent Examination of Draft Plan Strategy	Spring/Summer 2020
Adopt Plan Strategy	Summer/Autumn 2021
Publish Draft Local Policies Plan (8 week consultation period)	Autumn 2022
Independent Examination of Draft Local Policies Plan	Spring 2023
Adopt Local Policies Plan	Winter 2023
Monitoring & Review of Plan	Ongoing

6 Landscape and Visual Impact Assessment

6.1 Introduction

1. This Chapter of the ES evaluates the effects of the Development on the landscape and visual resource. This assessment was undertaken by Optimised Environments Limited (OPEN). The assessment considers the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of Operational Corkey Windfarm (initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (final phase).

2. The decommissioning of Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase of the Development has not been considered further in this assessment.

3. This Chapter of the ES is supported by the following Technical Appendix provided in **Volume 3 Technical Appendices**:

- Technical Appendix A6.1: Landscape and Visual Impact Assessment Methodology.

4. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

5. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

6.2 Legislation, Policy and Guidance

6. The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Department of the Environment Northern Ireland (2013). Planning Policy Statement 2: Natural Heritage.[1]
- Department of the Environment (2011). Derry Area Plan.[2]
- Department of the Environment (1989). Antrim Area Plan.[3]
- Department of the Environment (2016). Northern Area Plan.[4]
- Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper.[5]
- Department for Regional Development (March 2012). Regional Development Strategy 2035.[6]
- Department of Agriculture, Environment and Rural Affairs (2000). The Northern Ireland Landscape Character Assessment.[7]
- Northern Ireland Environment Agency (2010). Wind Energy Development in Northern Ireland's Landscapes.[8]
- Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy.[9]
- Landscape Institute and IEMA (2013). Guidelines for Landscape and Visual Impact Assessment: Third Edition' (GLVIA3).[10]
- Northern Ireland Environment Agency (NIEA) (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18: Renewable Energy.[11]
- Causeway Coast and Glens Heritage Trust (2008). Antrim Coast and Glens AONB Management Plan.[12]
- Scottish Natural Heritage (SNH) (2017). Siting and Designing Windfarms in the Landscape.[13]
- SNH (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.[14]
- SNH (2017). Visual Representation of Windfarms: Version 2.2.[15]
- The Landscape Institute (2011). Landscape Institute Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment.[16]
- The Landscape Institute (2017). Landscape Institute Technical Guidance Note 02/17: Visual representation of development proposals.[17]
- Countryside Agency and SNH (2002). Landscape Character Assessment Guidance for England and Scotland.[18]
- Countryside Agency and SNH (2002). Landscape Character Assessment Guidance Topic Paper 6: Techniques and Criteria for Judging Sensitivity and Capacity.[19]

6.3 Assessment Methodology and Significance Criteria

6.3.1 Scoping Responses and Consultations

7. Consultation for this ES topic was undertaken with the organisations shown in **Table 6.1**.

Table 6.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department of Agriculture, Environment and Rural Affairs	Scoping Response / 21/02/18	Natural Environment Division (NED) has provided advice to the Council on the likely significant environmental effects of the proposal, on the proposed assessment detailed within the Scoping Report and general guidance on the environmental impact assessment of windfarms.	Noted
Causeway Coast and Glens Borough Council	Scoping Response / 28/02/18	The Council is content with the proposed study areas for the LVIA and cumulative LVIA.	Noted
Causeway Coast and Glens Borough Council	Scoping Response / 28/02/18	The Council is content with the aspects proposed to be scoped out of the LVIA.	Noted

[1] Department of the Environment Northern Ireland (2013) Planning Policy Statement 2 Natural Heritage. Available online at: https://www.planningni.gov.uk/index/policy/planning_statements/pps2.htm
[2] Department of the Environment (2011). Derry Area Plan. Available online at: https://www.planningni.gov.uk/index/policy/development_plans/devplans_az/derry2011-adopted-plan.pdf
[3] Department of the Environment (1989). Antrim Area Plan.
[4] Department of the Environment (2016). Northern Area Plan.
[5] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper.
[6] Department for Regional Development (March 2012). Regional Development Strategy 2035.
[7] Department of Agriculture, Environment and Rural Affairs (2000). The Northern Ireland Landscape Character Assessment.
[8] Department of Agriculture, Environment and Rural Affairs (2010). Wind Energy Development in Northern Ireland's Landscapes
[9] Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy.
[10] Landscape Institute and IEMA (2013). Guidelines for Landscape and Visual Impact Assessment: Third Edition'.
[11] Northern Ireland Environment Agency's (NIEA) (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance (SPG) to accompany Planning Policy Statement 18 Renewable Energy.
[12] Causeway Coast and Glens Heritage Trust (2008). Antrim Coast and Glens AONB Management Plan.
[13] Scottish Natural Heritage (2017). Siting and Designing Windfarms in the Landscape.
[14] SNH (2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments.
[15] SNH (2017). Visual Representation of Windfarms: Version 2.2.
[16] The Landscape Institute (2011). Landscape Institute Advice Note 01/11, Photography and photomontage in landscape and visual impact assessment.
[17] Landscape Institute (2017). Technical Guidance Note 02/17: Visual representation of development proposals.
[18] Countryside Agency and SNH (2002). Landscape Character Assessment Guidance for England and Scotland, Countryside Agency and Scottish Natural Heritage.
[19] Countryside Agency and SNH (2002). Landscape Character Assessment Guidance Topic Paper 6: Techniques and Criteria for Judging Sensitivity and Capacity, Countryside Agency and Scottish Natural Heritage.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Causeway Coast and Glens Borough Council	Scoping Response / 28/02/18	The Council is content with the proposed viewpoints but would advise that this does not preclude the case officer or the Council Committee from seeking additional viewpoints.	Noted
Causeway Coast and Glens Borough Council	Scoping Response / 28/02/18	It appears that the information proposed is adequate but again this does not preclude the case officer or the Council Committee from seeking additional information.	Noted
Causeway Coast and Glens Borough Council	Pre-Application Meeting / 24/04/18	Council agreed in respect of the cumulative developments to be considered, that a cut of date of 6 months prior to submission for single turbines, and 3 months for windfarms was appropriate.	Cumulative information has been updated in May 2019 following input from CCGB Council and is presented in **Technical Appendix 2.3**. This is within 3 months of the anticipated submission date in June 2019.

6.3.2 Scope of Assessment

8. The key issues for the assessment of potential landscape and visual effects relating to the Development are:

- Temporary effects arising from the decommissioning and construction phases such as the removal or alteration of landscape elements and features, reconfiguration of landform, introduction of a construction compound, use of machinery, task and security lighting and the building of the components of the Development themselves;
- Permanent and potentially reversible effects on landscape and visual amenity - including cumulative; and
- Indirect effects on landscape and visual amenity – including cumulative.

6.3.3 Elements Scoped Out of Assessment

The assessment of key sensitivities presented in **Technical Appendix 6.2** has indicated those landscape and visual receptors that do not have potential to undergo significant effects; therefore, these are not required to be further assessed in the LVIA. **Table 6.2** sets out the landscape and visual receptors that are scoped out of the LVIA, as agreed with statutory consultees through the scoping process. The Development has been reviewed against the project description considered in the preparation of the Scoping Request and has been assessed that there is no material change to the preliminary assessment made at that time in order to define the scope.

Table 6.2: Receptors to be Scoped out of the LVIA

Receptor	Reason for being scoped out
Landscape Character Areas	
Landscape Character Areas beyond 15 km radius	Due to the distance to the Development and the landscape character of the Study Area. In particular, the fact that there is an operational windfarm on the Site, which is part of the baseline character and views towards it from other landscape character areas. Other operational and under construction windfarms also often occur within a similar part of long range views.
Lower Bann Valley	Zone of Theoretical Visibility (ZTV) shown to be patchy across far western side of Landscape Character Area (LCA) at a range beyond 14.8 km (Figure 6.8). LCA occurs in south-west of Study Area with no clear association with the Site.
Coleraine Farmland	ZTV shown across much of this LCA at a range of 14.9 km or more. Closest part of this LCA lies to the west of Ballymoney, which will form close range and intervening feature between LCA and the Site, which in turn makes a limited contribution to the character of this LCA.
Garry Bog	ZTV shown across much of this LCA at a range of 14.9 km or more. This is a small LCA with an enclosed, introverted character, and limited association with the Site.
Ballymena Farmland	ZTV shown to be patchy across parts of this LCA at a range of 11.6 km or more. This LCA comprises farmland wrapping around the north, east and southern sides of Ballymena. The main influences on landscape character come from the urban areas and enclosed farmland with no apparent association with the Site.
Landscape Planning Designations	
Causeway Coast Area of Outstanding Natural Beauty	Limited extent of ZTV at ranges beyond 18 km. Character of landscape is derived from its coastal location and views out over the sea. Development may be visible from elevated areas; however, such areas will be influenced by numerous other elements within the wider context - including urban areas and trees.
Areas of High Scenic Value River Bann area	Distances of greater than 20 km. Very limited visibility on ZTV at a range beyond 30 km.
Registered Gardens and Supplementary Sites beyond 15 km radius	Due to the distance to the Development and the landscape character of the intervening parts of Study Area. In particular, the fact that there is an operational windfarm on the Site, which is part of the baseline character and views towards it. Other operational and under construction windfarms also often occur within a similar part of long range views.
Gardenvale	Private house and garden not open to public. Limited extent of ZTV at 12.6 km.
Cleggan Lodge	Private house and garden not open to public. Limited extent of ZTV at 14.7 km.
Principal Visual Receptors	
Settlements beyond 20 km range	Distance to Development. Operational and under construction windfarms in similar part of views. Foreground screening and influence of a range of urban and landscape features within the intervening area.
Cushendall	Not in ZTV.
Broughshane	Not in ZTV.
Ballymena	This settlement lies 15.87 km from the Development. ZTV shown to be patchy especially across northern part of settlement where more open aspect to the north occurs.
Cullybackey	This settlement lies 15.90 km from the Development. ZTV shown to be very limited with small patches around fringes.
Ballycastle	Not in ZTV.
Carnlough	Not in ZTV.
Kilrea	This settlement lies 19.71 km from the Development. ZTV shown to comprise small patch of low level visibility.
Rail and road routes beyond 10 km	Distance to Development. Transient rather than static nature of viewers. Operational windfarms in similar part of views. Foreground screening and influence of a range of urban and landscape features within the intervening area.
B64	In respect of the section within the 10 km radius, ZTV shown to be patchy across eastern half. Although more continuous across western half, enclosure by vegetation and intervening landform will reduce potential for significant effects to arise.
A43	Limited extent lies within ZTV to south of Development where intervening foothills and enclosed farmland will reduce actual visibility.
B14	Not in ZTV.
B16	In respect of the section within the 10 km radius, ZTV shown to be mostly continuous although enclosure by vegetation and intervening landform will reduce potential for significant effects to arise.
National Cycle Routes	Distance to Development. Transient rather than static nature of viewers. Operational windfarms in similar part of views. Foreground screening and influence of a range of urban and landscape features within the intervening area.

Receptor	Reason for being scoped out
Antrim Hills Way	This route lies beyond 17 km to the south from the Development and shown with small patches in ZTV.
Dungonnell Way	Not in ZTV.
The Croaghan Way	This route lies beyond 7 km to the north from the Development and shown with very small section in ZTV.

6.3.4 Study Area

9. An area with a radius of 30 km from the nearest turbine in the Development has been applied as the Study Area and agreed with statutory consultees through the scoping process. This aligns with guidance presented in the SPG[20] which accompanies Planning Policy Statement 18, which states "*For turbines of medium or large commercial height we would generally recommend a radius of 20-30 km*." A ZTV analysis has been carried out for this area, based on the turbine layout, as has mapping of landscape character, designations and principal visual receptors. This Study Area is shown in **Figure 6.1** of Volume 2.

10. The Study Area is not intended to provide a boundary beyond which the Development will not be seen, but rather to define the area beyond which it is unlikely to have a significant landscape or visual effect. In reality, a significant effect is very unlikely to occur towards the edges of the Study Area due to a combination of factors such as distance from the Development, which ensures that the turbines will appear as minor features in views and will affect a very limited proportion of the wider views available; and screening by intervening buildings and vegetation.

11. The cumulative landscape and visual assessment also covers a Study Area of 30 km from the nearest turbine. Due to the nature of the Development as a repowering of an operational windfarm and the cumulative windfarm context within the local area, significant cumulative effects will not arise beyond this and are likely to be substantially more localised. No height threshold has been applied in the search for cumulative windfarms within a 5 km radius of the Wind Turbines, while a 50m height threshold has been applied across the 5 to 30 km radius. Cumulative Windfarms are shown in **Figure 6.12**. A cut-off date of 3 months prior to submission for single turbines and 6 months for windfarms was requested by CCGC, in respect of the collation of cumulative data. The final update of both sets of data was carried out in May 2019, 1 month prior to the anticipated submission date in June 2019.

6.3.5 Design Parameters

12. The main design parameter that has been applied to the Development relates to the consideration of the scale of the proposed turbines. The Development will be seen in relation to its landscape context and cumulative context, both of which will provide the basis for a comparison of scale. Slievenahanaghan is the hill upon which the Site sits and rises to a high point of 418 m Above Ordnance Datum (AOD). This provides capacity for turbines of a larger scale than the current 57m operational turbines. Gruig Windfarm lies to the immediate south and its ten turbines each 100m in height could highlight any large disparities in scale. These features of the baseline context have, therefore, influenced the scale of the proposed turbines and led to the height being proposed as a maximum of 137m to blade tip. In order to represent the worst case scenario, for the purposes of this assessment it has been determined that a rotor diameter of 120m should be assessed.

6.4 Baseline Survey Methodology

13. The assessment has been initiated through a desk study of the Site and 30 km Study Area. This study has identified aspects of the landscape and visual resource that will need to be considered in the landscape and visual assessment, including landscape-related planning designations, landscape character typology, and potential cumulative windfarms, routes (including roads, railway lines, National Cycle Routes and long-distance walking routes), and settlements.

14. The desk study has also utilised Geographic Information System (GIS) and Resoft Windfarm software to explore the potential visibility of the Development. The resultant ZTV diagrams (**Figures 6.6 to 6.11**) and wirelines used in the field have provided an indication of which landscape and visual receptors are likely to be key sensitivities in the assessment. **Figure 6.13** shows the theoretical visibility of the Operational Corkey Windfarm compared to the theoretical visibility of the Development, illustrating the limited increase in terms of the extent to which the existing and the proposed development would give rise to.

[20] Northern Ireland Environment Agency's (NIEA) (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance (SPG) to accompany Planning Policy Statement 18 Renewable Energy.

6.4.1 Field Survey

15. Field surveys have been carried out throughout the 30 km radius Study Area, although the focus is on the area that covers the Site and those areas that are shown on ZTVs to gain theoretical visibility of the Development. The baseline field survey has four broad stages:

- A preliminary familiarisation around the 30 km Study Area in order to visit landscape and visual receptors that have been identified through the desk study and verify their existence and importance. Important features and characteristics that have not become apparent through the desk study are also identified, and particularly sensitive receptors have been noted, in order to inform the design process;
- A visit in the vicinity of the Site, in order to establish the potential of the Site for windfarm development and identify the most suitable areas for development in landscape and visual terms, along with any constraints that may restrict the developable area;
- Further field survey around the 30 km Study Area, concurrent with the design process for the Development, to identify those receptors that are likely to be important in the assessment and inform the layout design, possible turbine height, and the extent of the Development; and
- The identification of representative viewpoints to include in the landscape and visual assessment, including a wide range of receptors, landscape character, and directions and distances from the Development.

6.4.2 Methodology for the Assessment of Effects

16. The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect. The full methodology for the assessment of effects is presented in **Technical Appendix A6.1**. The assessment has been carried out with Operational Corkey Windfarm considered as an established part of the baseline, with the assessment of sensitivity, magnitude of change and significance, for each receptor, assessed against this baseline.

17. OPEN's LVIA methodology accords with the guidance set out in the GLVIA321. Where it diverges from specific aspects of the guidance, in a small number of areas, reasoned professional justification for this is as follows.

18. GLVIA3 sets out an approach to the assessment of magnitude of change in which three separate considerations are combined within the magnitude of change rating. These are the size or scale of the effect, its geographical extent and its duration and reversibility. This approach is to be applied in respect of both landscape and visual receptors with reference made in paragraphs 5.48, 5.50-5.52, 6.38 and 6.40-6.41 of GLVIA3.

19. OPEN considers that the process of combining all three considerations in one rating can distort the aim of identifying significant impacts in respect of large scale developments. For example, an increased magnitude of change, based on size or scale and geographical extent, may be reduced to a lower rating if it occurs for a short duration. This might mean that a potentially significant effect would be overlooked if impacts are diluted down due to their limited duration or reversibility. Conversely, a magnitude of change rating may be increased to a higher level if for a longer duration and may lead to a significant impact despite the size or scale and geographical extent of the impact being relatively small.

20. OPEN has chosen to keep the consideration of duration and reversibility separate, by basing the magnitude of change on size or scale and geographical extent to determine where significant and not significant impacts occur, and then describing their duration and reversibility separately.

6.4.2.1 Sensitivity

21. The sensitivity of a landscape or visual receptor is determined by a combination of the value of the receptor and the susceptibility of the receptor to the change that the Development would have on the landscape character or the view.

22. The sensitivity of the landscape or visual receptor is evaluated as high, medium-high, medium, medium-low or low by combining the value of the receptor and its susceptibility to change. The basis for the assessments is made clear using evidence and professional judgement in the evaluation of each receptor.

[21] Landscape Institute and EIMA (2017). Guidelines for Landscape and Visual Impact Assessment

23. The criteria used to assess value and susceptibility in respect of landscape and visual receptors differs slightly as described below.

6.4.2.2 Value

24. The value of a landscape character receptor is determined through its importance in terms of any designations that may apply as well as its scenic quality, sense of place, rarity and representativeness. The value is also determined by the experience of the landscape in relation to perceptual responses, cultural associations, its iconic status, its recreational value, and the contribution of other values such as nature conservation or archaeology.

25. The value of a view is a reflection of the recognition and importance attached either formally through identification on mapping or being subject to planning designations, or informally through the value which society attaches to the view(s).

26. The value of the landscape or visual receptor is evaluated as high, medium-high, medium, medium-low or low. The basis for the assessments is made clear using evidence and professional judgement in the evaluation of each receptor.

6.4.2.2.1 Susceptibility

27. Susceptibility, in respect of the LVIA, relates to the ability of the landscape or visual receptor to accommodate the changes that would occur as a result of the addition of the Development to the baseline situation.

28. In respect of landscape receptors, considerations include the specific nature of the Development, e.g. its size, scale, location, context and characteristics; the degree to which the receptor may accommodate the influence of the Development; and the extent to which it would influence the character of the landscape receptors across the 30 km Study Area.

29. In respect of visual receptors, considerations include the nature of the viewer experiencing the view and how susceptible they are to the potential effects of the Development. Professional judgement is used based on the occupation or activity which viewers are engaged in at the viewpoint or series of viewpoints. The principal visual characteristics, e.g. those features which define the view, and the viewer's experience of the visual receptor in relation to the extent to which their focus is directed towards the view, the duration and clarity of the view and whether it is a static or transitory view, is also considered

30. The susceptibility of the landscape or visual receptor is evaluated as high, medium-high, medium, medium-low or low. The basis for the assessments is made clear using evidence and professional judgement in the evaluation of each receptor.

6.4.2.3 Magnitude of Change

31. The magnitude of change, in respect of the LVIA, differs in respect of landscape and visual receptors. The differences are set out below.

6.4.2.3.1 Landscape Receptors Magnitude of Change

32. The magnitude of change on landscape character receptors is an expression of the scale of the change that would result from the Development and is dependent on variables relating to the size or scale of the change and its geographical extent.

33. The basis for the appraised level is made clear using evidence and professional judgement, based on the following criteria:

- The extent of existing landscape elements that would be lost and their ability to be reinstated, the proportion of the total this represents as well as the contribution of that element to the character of the landscape;
- The degree to which the pattern of elements that makes up the landscape character would be altered by the Development, i.e. by removal or addition of elements in the landscape;
- The extent to which the effects change the key characteristics of the landscape as identified in the baseline study, which may be critical to the distinctive character of the landscape;
- The distance between the landscape character receptor and the Development. Generally, the greater the distance, the lower the scale of change; and
- The proportion of the Development that would be seen.

34. Intermediate levels may also be included such as medium-high or medium-low, where the change falls between the definitions.

6.4.2.3.2 Views Magnitude of Change

35. The magnitude of change on views is made clear using evidence and professional judgement, based on the following criteria:

- The distance between the visual receptor and the Development. Generally, the greater the distance, the lower the magnitude of effect;
- The scale and character of the context within which the Development would be seen. This would determine the degree to which the Development can be accommodated in the existing outlook. The scale of the landform/buildings, the patterns of the landscape, the existing land use and vegetation cover, and the type and form of development seen in the baseline view would all be relevant;
- The extent of the Development that would be seen. Visibility of the Development may range from the full height of the turbines to just the upper parts;
- The position of the Development in relation to the principal orientation of the receptor. If the Development is seen in a specific, directional vista from a receptor the magnitude of effect would generally be greater; and
- The width of the view available and the proportion of the view that is affected by the Development. Generally, the more of a view that is affected, the higher the magnitude of effect.

36. Intermediate levels may also be included such as medium-high or medium-low, where the change falls between the definitions.

6.4.2.3.3 Cumulative Magnitude of Change

37. The cumulative magnitude of change is an expression of the degree to which landscape character receptors and visual receptors would be changed by the replacement of Operational Corkey Windfarm with the Development in relation to other schemes that are already operational or proposed. The main assessment considers the effects of the Development in addition to a number of operational windfarms within the close to medium range and therefore the following criteria are also taken into account in the main assessment:

- The location of the Development in relation to other developments. If the Development is seen in a part of the view that is not affected by another development, this would generally increase the cumulative magnitude of change as it would extend the influence of development into an area that is currently unaffected. Conversely, if the Development is seen in the context of other developments, or as a replacement to an existing development, then the cumulative magnitude of change may be lower as it is not extending development to undeveloped parts of the outlook. This is particularly true where the scale and layout of the Development is similar to that of the other sites, as where there is a high level of integration and cohesion with an existing site, the various developments may appear as a single site.
- The extent of the developed skyline. If the Development would add notably to the developed skyline in a view, the cumulative magnitude of change would tend to be higher, as the appearance of the skyline has a particular influence on both views and landscape receptors.
- The number and scale of developments seen simultaneously or sequentially. Generally, the greater the number of clearly separate developments that are visible, the higher the cumulative magnitude of change would be. The addition of the Development to a view where a greater number of smaller developments are apparent would usually have a higher cumulative magnitude of change than a view of one or two large developments, as this can lead to the impression of a less co-ordinated or strategic approach.
- The scale comparison between developments. If the Development is of a similar scale to other visible developments, particularly those seen in closest proximity to it, the cumulative magnitude of change would generally be lower, as it would have more integration with the other sites and would be less apparent as an addition to the cumulative situation.
- The consistency of image of the Development in relation to other developments. The cumulative magnitude of change of the Development is likely to be lower if its turbine height, arrangement and layout design are broadly similar to other developments in the landscape, as they are more likely to appear as relatively simple and consistent components of the landscape.
- The context in which the developments are seen. If developments are seen in a similar landscape context, the cumulative magnitude of change is likely to be lower due to visual integration and cohesion between the sites. If developments are seen in a variety of different landscape settings, this can lead to a perception that development is unplanned and uncoordinated, affecting a wide range of landscape characters.
- The distance of the Development from the viewpoint or receptor. As in the assessment of the Development itself, the greater the distance, the lower the cumulative magnitude of change would tend to be.
- The magnitude of change of the Development as assessed in the main assessment. The lower this is assessed to be, the lower the cumulative magnitude of change is likely to be. Where the Development itself is assessed to have a negligible

magnitude of change on a view or receptor there would not be a cumulative impact as the contribution of the Development would equate to the 'no change' situation.

6.4.2.4 Assessment of Significance

38. The significance of effects is assessed through a combination of the sensitivity of the landscape receptor/ view, and the magnitude of change that will result from the addition of the Development. While OPEN's methodology is not reliant on the use of a matrix to arrive at the conclusion of a significant or not significant effect, a matrix is included below in **Table 6.3** to illustrate how combinations of sensitivity and magnitude of change ratings can give rise to significant effects. The matrix also gives an understanding of the threshold at which significant effects may arise.

Table 6.3: Significance Matrix

Magnitude Sensitivity	High	Medium-High	Medium	Medium-Low	Low	Negligible
High	Significant	Significant	Significant	Significant / Not Significant	Not Significant	Not Significant
Medium-High	Significant	Significant	Significant / Not Significant	Significant / Not Significant	Not Significant	Not Significant
Medium	Significant	Significant / Not Significant	Significant / Not Significant	Not Significant	Not Significant	Not Significant
Medium-Low	Significant / Not Significant	Significant / Not Significant	Not Significant	Not significant	Not Significant	Not Significant
Low	Significant / Not Significant	Not Significant	Not Significant	Not Significant	Not Significant	Not Significant

39. Effects within the green boxes in the matrix are considered to be significant in terms of the EIA Regulations. Effects within the light grey boxes may be significant or not significant, depending on the specific relevant factors that arise at a particular landscape or visual receptor. Effects in the white boxes are considered not significant. In accordance with GLVIA3 experienced professional judgement is applied to the assessment of all effects and reasoned justification is presented in respect of the findings of each case.

40. The geographic extent over which the landscape and visual effects will be experienced is also assessed, which is distinct from the size or scale of effect. This evaluation is not combined in the assessment of the level of magnitude but instead is used in determining the extent in which a particular magnitude of change is experienced and the extent of the significant and non-significant effects. The extent of the effects will vary depending on the specific nature of the development proposed and is principally assessed through analysis of the geographical extent of visibility of the Development across the visual receptor.

41. The extent of effects on views is based on the following factors:

- The extent of a receptor (a road, footpath or settlement, for example) from which the Development may be seen; and
- The extent to which the change would affect views, whether this is unique to a particular viewpoint or if similar visual changes occur over a wider area represented by the viewpoint.

42. The duration and reversibility of effects on views are based on the period over which the Development is likely to exist and the extent to which the Development will be removed, and consideration given to whether its effects can be reversed. Duration and reversibility are not incorporated into the overall magnitude of change and may be stated separately in relation to the assessed effects.

43. GLVIA3 defines 'significance' as "a measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic" (GLVIA3 glossary). It does not define what may constitute a 'significant' effect or provide thresholds that indicate where effects would become significant rather than not significant, but states that "there are no hard and fast rules about what effects should be deemed 'significant'" (paragraph 3.32). This is further expanded upon in paragraph 5.54 (in relation to landscape effects), which states that "significance can only be defined in relation to each Development and its specific location. It is for each assessment to determine how the judgements about the landscape receptors and landscape effects should be combined to arrive at significance and to explain how the conclusions have been derived".

44. GLVIA3 also states that the assessment of significance is "an evidence-based process combined with professional judgement" (paragraph 3.23). Professional judgement is, as acknowledged in GLVIA3, a very important aspect of LVIA, and it is important to remember that "even with qualified and experienced professionals there can be differences in the judgements made. This may result from using different approaches or different criteria, or from a variation in judgements based on the same approach and criteria" (GLVIA3 paragraph 2.25).

45. In OPEN's methodology, a significant effect occurs where the Development will provide a defining influence on a landscape element, landscape character receptor or view. A not significant effect occurs where the effect of the Development is not material, and the baseline characteristics of the landscape element, landscape character receptor, view or visual receptor continue to provide the definitive influence. In this instance, the Development may have an influence, but this influence will not be definitive. Significant cumulative landscape and visual effects arise where the addition of the Development to other windfarms leads to windfarms becoming a prevailing landscape and visual characteristic.

46. It is important to remember that the assessment of significance in LVIA terms, as required by The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 and set out in GLVIA3, does not provide any indication of the 'acceptability' of the Development, and that the occurrence of significant effects does not in any way imply that a Development would be 'unacceptable'. As stated in GLVIA3 (page 153), the LVIA text should "be impartial and dispassionate, presenting information and reasoning accurately and in a balanced way, and making clear where statements are based on the author's judgement."

47. It is widely acknowledged that commercial-scale windfarm development will almost inevitably give rise to effects that are assessed as being significant in EIA terms, and this does not render this type of development unacceptable. Planning Policy Statement 18 acknowledges the nature of landscape and visual effects of windfarms (paragraph 4.14), stating that "of all renewable technologies, wind turbines are likely to have the greatest visual and landscape effects" and that "the Department recognises that the impact of turbines on the landscape will vary according to the size and number of turbines and the type of landscape involved, and that some of these impacts may be temporary if conditions are attached to planning permissions which require the future decommissioning of turbines."

6.4.2.5 Nature of Effects

48. The 'nature of effects' relates to whether the effects of the Development are positive, neutral or negative. Guidance provided in GLVIA3 states that "thought must be given to whether the likely significant landscape and visual effects are judged to be positive (beneficial) or negative (adverse) in their consequences for landscape or for views and visual amenity" but does not provide an indication as to how that may be established in practice. The nature of effect is therefore one that requires interpretation and reasoned professional opinion.

49. In relation to many forms of Development, the ES will identify positive or negative effects under the term nature of effect. The landscape and visual effects of windfarms are difficult to categorise in either of these brackets as, unlike other disciplines, there are no definitive criteria by which these effects can be measured as being categorically beneficial or adverse. For example, in disciplines such as noise or ecology it is possible to identify the nature of the effect of a windfarm by objectively quantifying its effect and assessing the nature of that effect in prescriptive terms. However, this is not the case with landscape and visual effects, where the approach combines quantitative and qualitative assessment.

50. OPEN will define positive, neutral and negative effects as follows:

- Positive effects contribute to the landscape and visual resource through the enhancement of desirable characteristics or the introduction of new, beneficial attributes. The removal of undesirable existing elements or characteristics can also be positive, as can their replacement with more appropriate components;
- Neutral effects occur where the Development neither contributes to nor detracts from the landscape and visual resource and is accommodated with neither positive nor negative effects, or where the effects are so limited that the change is hardly noticeable. A change to the landscape and visual resource is not considered to be adverse simply because it constitutes an alteration to the existing situation; and

- Negative effects are those that detract from or weaken the landscape and visual resource through the introduction of elements that contrast, in a detrimental way, with the existing characteristics of the landscape and visual resource, or through the removal of elements that are key in its characterisation.

51. OPEN generally adopts a precautionary approach which assumes that significant landscape and visual effects will be weighed on the negative side of the planning balance, although positive or neutral effects may arise in certain situations.

6.4.2.6 Duration and Reversibility of Effects

52. The effects of the Development are of variable duration and are assessed as either short-term or long-term and permanent or reversible. The turbines, meteorological mast, site access tracks, substation and Energy Storage Unit have been assumed to be present for the operational life, and the effects associated with these components are considered to be permanent, but largely reversible upon decommissioning.

53. Other infrastructure and operations such as the decommissioning and construction processes and plant, including tall cranes for turbine erection and construction compounds, will be apparent only during the initial decommissioning and construction period of the Development and are considered to be short-term effects.

54. The reversibility of effects is variable. The most apparent effects on the landscape and visual resource, which arise from the presence of the turbines, are reversible as the turbines can be removed, as can the substation and meteorological mast. The effects of the tall cranes and heavy machinery used during the decommissioning and construction and period are also reversible.

55. The access tracks for the Operational Corkey Windfarm will be reused as far as possible or will otherwise be regraded and reinstated with local vegetation as required. It has been assumed that turbine foundations and underground cabling will be left in-situ below ground with no residual landscape and visual effects. Detail on the decommissioning of Operational Corkey Windfarm and construction of the Development is set out in **Chapter 3 Development Description**, the Outline DCEMP, and the Draft HMP presented in **Technical Appendix 3.1** and **3.2** respectively.

6.4.3 Assessment Limitations

56. Photographs and other graphic material such as wirelines and photomontages used in the assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what will be apparent to the human eye. The assessment itself is carried out from observations in the field and therefore may include elements that are not visible in the photographs.

6.4.3.1 Zone of Theoretical Visibility (ZTV)

57. There are limitations in the theoretical production of ZTVs, and these should be borne in mind in their consideration and use:

- Ordnance Survey Terrain 10 m DTM has been used to generate the ZTV's within the Study Area. The analysis is based on visibility at points on a 5m grid and does not take into account local, small-scale landform changes in analysing theoretical visibility.
- The ZTVs illustrate the 'bare ground' situation, and do not take into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility;
- The ZTVs do not indicate the reduction in visibility that occurs with increased distance from the Development. The nature of what is visible from 3km away will differ markedly from what is visible from 10km away, although both are indicated on the ZTVs as having the same level of visibility; and
- It is important to remember that there is a wide range of variation within the visibility shown on the ZTV. For example, an area shown on the blade tip ZTV as having visibility of all of the turbines may gain views of the smallest extremity of blade tips, or of full turbines. This can make a considerable difference in the effects of the Development on that area.

58. These limitations mean that while the ZTVs are used as a starting point in the assessment, providing an indication of where the Development will theoretically be visible, the information drawn from the ZTVs is not completely relied upon to accurately represent visibility of the Development.

6.4.3.2 Visualisations

59. The visualisations are based on theoretical visibility from 1.5 metres above ground level. There are limitations in these theoretical productions, and these should be borne in mind in the consideration and use of the wireline images. Firstly, the wireline illustrates the 'bare ground' situation, not taking into account the screening effects of vegetation, buildings, or other local features that may prevent or reduce visibility. Secondly, the wireline is based on OS Terrain 10 m DTM, so there may be local, small-scale landform variations that are not reflected in the wireline but may alter the actual visibility of the Development, either by screening theoretical visibility or revealing parts of the Development that are not theoretically visible. Thirdly planning conditions are likely to allow the locations of the turbines to be horizontally micro-sited to up to 50 m and the levels of the turbine bases have not yet been established in detail as this will be determined through site investigations and engineering design. Both of these factors may alter the base and therefore the tip heights of the turbines above ground level from those that are assumed in the assessment and shown in figures. Such variation may also affect ZTVs to a minor degree.

60. Where descriptions within the assessment identify the numbers of turbines visible this refers to the theoretical illustrations generated and therefore the reality may differ to a degree from these impressions. These factors are unlikely to make a material difference to the outcome of the assessment.

61. Not all areas of the 30 km Study Area are publicly accessible, and this has limited the specific assessment of views from residential and other properties, for example. Not all parts of the 30 km Study Area have been visited due to time and accessibility constraints. Notwithstanding these limitations, the assessors consider that there is sufficient information available, from publicly accessible viewpoints, to form a competent assessment of the likely landscape and visual amenity effects.

6.4.4 Embedded Mitigation

62. This section describes the landscape and visual mitigation measures which have been incorporated through the iterative design of the Development in order to prevent, reduce or offset potentially negative landscape and visual effects caused by the decommissioning and construction and operation of the Development. It should be read in conjunction with the full project description and the rationale for site selection and scheme design in Chapter 3: Development Description and Chapter 4: Site Selection and Alternatives.

6.4.4.1 Site Suitability

63. The Site lies within an area of upland moorland on the western edge of the Antrim Hills and the eastern edge of the River Main. It is offset to the west of the main features of the Antrim Coast and Glens AONB, such that visibility from these more sensitive landscapes is minimised. The Site is influenced directly by the presence of Operational Corkey Windfarm and its associated infrastructure and indirectly by Gruig Windfarm to the immediate south. The wider area is also influenced by large blocks of coniferous woodland plantation to the east, and farmland and settlement to the west. The suitability of the Site for windfarm development relates principally to the landscape character of the Site and surrounding upland landscape, as well as the presence of existing windfarm developments. Slievenahanaghan Hill has proved a suitable site for Operational Corkey Windfarm which has been running for over 20 years.

64. The character of the surrounding landscape is defined as the Moyle Moorlands and Forests LCA which presents a scale and simplicity with potential to accommodate structures such as wind turbines. This potential has been realised with the development of Operational Corkey Windfarm and Gruig Windfarm, which together form a cluster on Slievenahanaghan Hill. The Site does not impinge on the more scenic coast and glens, which are found across the eastern side of the Study Area. It also does not come close to villages and towns or other sensitive visual receptors, although there are dispersed rural dwellings in closer proximity. Furthermore, Slievenahanaghan Hill presents one of the few upland sites in Northern Ireland with capacity to accommodate larger scale turbines.

6.4.4.2 Layout design

65. The design of the windfarm layout is a vital part of the EIA process, as it is at this stage that the biggest contribution can be made to mitigate potential landscape and visual effects. This helps to create a windfarm which is appropriate for the existing landscape character and visual features of an area. The iterative design process allows the effects of different windfarm layouts to be assessed then modified to prevent, reduce or offset effects. The residual effects reported in the following section therefore include embedded mitigation in the form of design refinement and consideration against landscape and visual objectives, for example, arranging turbines with respect to landform features, particular consideration of a view of the windfarm from a highly valued landscape, or ensuring the arrangement of turbines is aesthetically balanced from sensitive viewpoints.

66. In order to minimise negative effects on landscape and visual receptors, a number of design principles were considered. These principles sought to reduce significant effects through alterations to layout, design and siting (insofar as was possible given the other technical and environmental constraints), management practices and mitigation. The design objectives relate

to the characteristics of the existing landscape and visual environment described in the section on 'Baseline information' above, and are set out as follows:

- To consider the latest wind turbine technology available, larger rotor sizes and turbine hub heights to arrive at a turbine tip height considered appropriate for the Site;
- To create a visually legible design, insofar as was possible on a Site, which is constrained by other environmental and technical issues, and create a simple, positive layout, viewed consistently from different positions;
- To ensure that the views of the Development from the Antrim Coast and Glens AONB, in particular those from Viewpoint 7: Slieveanorra, appear legible and the turbines relate well to the landform and each other;
- To create a compact scheme which relates to the underlying landform, with turbines laid out to extend along the ridgeline created by Slievenahanaghan Hill;
- To re-use sections of the existing access track into Operational Corkey Windfarm, minimising the need for additional tracks;
- To group turbines to create a balanced and coherent image, avoiding where possible 'stacking' or overlapping of turbine rotors in lines, favouring an evenly spaced and elevated group, that reflects the nature of the undulating landscape;
- To site buildings within low lying areas that are on the less visible south-west side of Slievenahanaghan Hill; and
- To group the infrastructure in order to limit the number of areas affected.

67. The iterative design process has refined the original layout to help mitigate the potential effects of the Development on the landscape and visual receptors. The key consideration has been the potential effects on the Antrim Coast and Glens AONB and the views from the nearby minor roads and rural settlements. Environmental constraints, relating to areas with special sensitivities in respect of hydrology and peat, as well as constraints of gradient and set back from the existing Gruig turbines and nearby residential properties, have been taken into account in the design iteration and this has discounted areas from windfarm development.

6.5 Baseline Description

6.5.1 Site

68. The Site comprises the rounded hill top of Slievenahanaghan which rises to a high point of 418 m AOD. The Site is characterised by the presence of Operational Corkey Windfarm which comprises 10 turbines, each with a blade tip height of 57 m. An access track ascends the south-western flank of the hill with smaller branches connecting each of the turbines. The operational wind turbines and existing infrastructure associated with the Operational Corkey Windfarm form part of the baseline conditions considered in the assessment.

69. The landform is smooth and rounded to create a convex profile across the hilltop. The landcover comprises rough grassland and moorland, while the lower western slopes comprise semi-improved grassland. The pattern of the landscape is broad with only occasional stone dykes or post and wire fences to define fields. This creates an open and exposed upland landscape which lacks enclosure. Alongside the generation of renewable energy, hill sheep farming is the principle land use. Other developments on Slievenahanaghan Hill include a mast to the south-west, agricultural scale single wind turbines to the north-west and west, and farmsteads on the lower slopes, accessed from Reservoir Road which passes over the northern end of the hill and from Corkey Road which passes along the base to the west. In addition to the series of farmhouses and rural properties set along the western flank of the hill, there are intermittent clusters of farm buildings, including a couple of large, recently developed chicken sheds.

6.5.2 Site Context

70. The Development is located on the western periphery of the Antrim Hills, which coincides with the western boundary of the Antrim Coast and Glens AONB (**Figure 6.4**). The low-lying valley of the River Main is situated to the west and the broader range of the Antrim Hills to the east. The predominant orientation of the uplands and the valley is from south-east to north-west, towards the coastline, with ridgelines and roads generally following this alignment.

71. The valley landscape to the west is characterised by arable and pastoral farmland, laid out in enclosed fields with a fine network of rural roads as well as dispersed farmsteads, dwellings and settlements integrated within the rural landscape. The valley landscape is gently undulating with intermittent drumlins. The broader landform comprises western and eastern valley sides falling in towards the River Main which runs south to north through the trough of the valley. Tributary water courses follow the valley shape to feed into the River Main. The western valley side is formed by the eastern flank of Long Mountain and the eastern valley side is formed by the western flank of the foothills to the Antrim Hills, with both hill groups following the south to north orientation.

72. The historical land ownership pattern of this area is based on the land being divided into small plots. This has led to a dispersed settlement pattern, whereby individual dwellings occur frequently across the landscape, accessed by the network of rural roads. Larger consolidated settlements also exist, such as Clough Mills at approximately 6 km to the south-west of the Wind Turbines, Dunloy at approximately 9 km to the west and Ballymoney at approximately 15 km to the north-west, but these larger settlements are infrequent, and it is more typical for small clusters of dwellings to occur. The main road through the valley is the A26 which connects the M2/M22 north of Antrim in the south with Coleraine in the north.

73. The upland landscape to the east of the Site presents a marked contrast to the valley landscape. Whilst dispersed development continues along the Altnahinch and Old Cushendun Roads, there is very little residential development in the upland hills. The land use pattern changes from a predominance of arable and pastoral farmland to a predominance of commercial forestry and open moorland. The forestry encloses large parts of this landscape such that there is little inter-visibility or association between one area and the next. It is only from the elevated open moorlands that expansive views of the wider landscape can be experienced.

74. Larger commercial windfarms are a feature of the 30 km Study Area, albeit typically seen set on the enclosing ridgelines of the upland areas to the west and east. The ridgelines largely define the view-sheds of the lowland and upland valleys and the main draw of views is typically east-west across the valleys, and then, north-south through the valleys. As well as the Operational Corkey Windfarm, there are two other operational windfarms on this western edge of the Antrim Hills: Gruig Windfarm to the immediate south and Altaveedan Windfarm to the north. Collectively, these windfarms establish this type of development as part of the baseline character of these hills. A cluster of three windfarms occur between 10 and 15 km on Long Mountain to the south-east, comprising Garves, Glenbuck I and II, and Long Mountain, and another cluster of two windfarms occur to the south, comprising Rathsherry and Elginny Hill. Also, within the lower lying areas there are numerous moderately large single turbines or pairs, and other smaller turbines often associated with farmsteads, industry or domestic dwellings.

6.5.3 Landscape Character

75. Policy RG11 of the Regional Development Strategy[22] notes the importance of landscape character in planning:

76. *"Landscape character is what makes an area unique. It is defined as "a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse". We can only make informed and responsible decisions on the management and planning of sustainable future landscapes if we pay proper regard to their existing character. By understanding how places differ we can also ensure that future development is well situated, sensitive to its location, and contributes to environmental, social and economic objectives. The Northern Ireland Landscape Character Assessment 2000 provides valuable guidance on local landscape character and scenic quality*."

77. Landscape character information is based on the Landscape Character Areas (LCAs) that are described in the Supplementary Planning Guidance (SPG) document entitled 'Wind Energy Development in Northern Ireland's Landscapes'[23]. This 2010 report in turn draws from the LCAs that were originally identified in The Northern Ireland Landscape Character Assessment (NILCA) 2000[24]. The Northern Ireland landscape was subdivided into 130 different landscape character areas, each with a distinctive character. Causeway Coast and Glens Borough Council comprises 24 Landscape Character Areas (LCAs), some of these are shared with neighbouring districts. The NILCA also identifies Areas of Scenic Quality. They represent a second tier (below AONBs) in the hierarchy of landscape classifications. There are no Areas of Scenic Quality in the 20 km radius of the Development Wind Turbines.

78. The Northern Ireland Environment Agency prepared and signed Northern Ireland's Landscape Charter in 2014[25] in response to the European Landscape Convention[26]. It advises the following:

[22] Department for Regional Development (2010). Regional Development Strategy 2035.
[23] NIEA (2010). Wind Energy Development in Northern Ireland's Landscapes Supplementary Planning Guidance to Accompany Planning Policy Statement 18 'Renewable Energy'.
[24] Department of the Environment (2000). Northern Ireland Landscape Character Assessment 2000.
[25] Northern Ireland Environment Agency (2014). Northern Ireland's Landscape Charter.
[26] Council of Europe (2000). European Landscape Convention.

79. *"The European Landscape Convention is not just about designating special landscapes but putting a value on people's perception of place: where they live, work and enjoy themselves.*

80. *Today, doing nothing is no longer an option. This Landscape Charter calls on us to act. The pace of change in our landscape can be gradual and incremental or increasingly sudden and dramatic, accelerated by new technologies. In order to value the asset that is our landscape, built or natural, we must understand both the value of the asset and the forces for change so that we can make informed decisions. This will be even more important after April 2015 when these decisions will be made by new councils with new spatial planning powers under the Review of Public Administration.*

81. *As our first commitment to the Northern Ireland Landscape Charter, the Northern Ireland Environment Agency shall be renewing the Landscape Character Assessment for Northern Ireland in time for this change in local governance and in line with best practice elsewhere in the United Kingdom.'*

82. In 2015 the Northern Ireland Regional Landscape Character Assessment[27] (NIRLCA) was prepared for the Northern Ireland Environment Agency by LUC in association with Mullin Design Associates and Julie Martin Associates. A final version of the Background Report is dated 9 July 2015. The information presented consists of a Background Report and web-based mapping and viewer. It has been issued in this way to reflect the dynamic nature of the landscape and it is proposed that it will be updated as the landscape evolves.

83. The NIRLCA *"provides a strategic overview of the landscape, which can be complemented by more detailed local studies in future"*. In relation to the earlier NILCA it states that:

84. *"there has been a substantial phase of building and other development in both urban and rural areas of Northern Ireland since its publication, such as housing or renewable energy, which has affected the character of many of our landscapes. The purpose of the NIRLCA is not to replace, but to complement, the earlier NILCA 2000, though further work to update and It is intended that the strategic view supplied by the NIRLCA will be complemented by more detailed landscape character assessment at a local scale.*

85. *This finer grained layer of assessment should pick up more local issues and will inform local planning, where the NIRLCA meshes with regional planning. It is essential that future local assessments are carried out in a systematic and consistent way across all of Northern Ireland's new local authority areas, and NIEA will actively encourage this process. Until the new local assessments are in place, the earlier Northern Ireland Landscape Character Assessment 2000 (NILCA), comprising 130 character areas, will continue to be applied.*"

86. At the time of writing this LVIA (early 2019) there have been no further 'finer grained' landscape character assessments undertaken to inform local planning and therefore the NILCA forms the basis of the baseline landscape characterisation. However, the character descriptions have also been informed by the descriptions contained in the NIRLCA web-based viewer, providing an update to the local character. This is the approach that was agreed through the scoping process.

87. In 2018 the Causeway Coast and Glens Borough Council published its Local Development Plan 2030 Preferred Options Paper, Discussion Paper 4: Landscape Character[28]. It sets out the history and relevance of landscape characterisation within Northern Ireland since 2000. It references the Consultation Draft version of the NIRLCA dated April 2015 and states that:

88. "*The aim of the NIRLCA is provide information which can be used by planners, developers and the public. The Assessment will provide an evidence base to make informed decisions about the management of Northern Ireland's Landscapes.'*

89. However, it also acknowledges that '*The NIRLCA acts on a strategic level and advises that it can be complemented by more detailed local studies in the future."*

90. Therefore, although this Paper has been published since the scoping process was undertaken it is considered that the agreed approach remains appropriate to the scale of windfarm development and planning.

91. The LCAs that cover the Study Area are shown in relation to the ZTV in **Figure 6.8**. The landscape of the area is characterised by north to south running swathes of broadly similar landscapes following the pattern of the landform and valley structure. There are some pockets of differing character and a transition into different areas as one moves from north to south through changes in elevation.

92. The immediate landscape setting of the Development and the wider area to the north and east is covered by the Moyle Moorlands and Forest LCA which is a north to south running area that runs from the coast in the north to the Central Ballymena Glens the in the south. This is an upland landscape with rounded hills rising to approximately 550 m AOD and landcover mix of moorland and forestry.

93. The Key Landscape and Visual Characteristics and Values are identified in the SPG[29]. In relation to windfarm development the document advises that the overall sensitivity is "high to medium" and provides the following advice:

94. "*The scale and landform of at least parts of this LCA are in theory well suited to wind energy developments in landscape and visual terms*." The guidance refers to the plateau landscapes of the central part of the LCA as being less sensitive than the more distinct hill tops where the Operational Corkey Windfarm is located. While the presence of operational developments in this part of the LCA is acknowledged, the sensitivities relating to this location are highlighted. In relation to the location, siting, layout and design considerations the following information is provided:

95. "*Particular care needs to be taken to avoid significant impacts on key views from either the lowland landscapes to the west or from adjacent glens to the north, east and south and on the wild character of the area*." The Operational Corkey Windfarm already has an influence on the character of the landscapes to the west, while visibility over the adjacent glen is limited.

96. At the time of the LCA assessment, there were two operational windfarms in this LCA; the Operational Corkey Windfarm (10 turbines of 57 m) and Gruig Windfarm (10 turbines of 100 m) which together form a cluster. The SPG notes that "*Careful consideration will need to be given to cumulative impacts and separation distances from existing developments*."

97. To the west of the Moyle Moorlands and Forest LCA lies the Cullybackey and Clough Mills Drumlins LCA and the Long Mountain LCA to the west of that. The Cullybackey and Clough Mills Drumlins LCA is characterised by the general fall of the western and eastern valley sides towards the valley of the River Main, which flows south to north. Landcover is agricultural with a predominance of fields of pasture and substantial pattern of hedgerow and stone wall enclosure. In terms of overall sensitivity and despite the absence of any local or national landscape designations, this is rated as medium to high, in respect of which the SPG makes the following statement:

98. "*For much of this landscape views are inward-looking and short, interrupted by topography and vegetation. This reduces the sensitivity of this landscape to wind energy development. However, the variation in topography over the short distances and the small scale of the drumlins (which are often just 20m height) and the complex landform mean that this landscape could easily be overwhelmed by poorly sited or inappropriately scaled wind energy development especially since there is already wind energy development in adjoining LCAs to east and west*."

99. Altogether, four LCAs are considered to have potential to undergo significant effects as a result of the Development and are therefore assessed in detail in this Chapter. This includes the LCAs that lie entirely in the area defined in the SPG as Landscape Setting (between 5 km and 15 km from the nearest turbine), and all of the LCAs that lie in the Broad Landscape Context (between 15 km and 30 km from the nearest turbine). The assessment of effects on landscape character focusses on these four LCAs that have potential to undergo significant effects. More detailed baseline information on these LCAs is provided in **Section 6.7.4 to 6.7.8**.

- Moyle Moorlands and Forest LCA;
- Cullybackey and Clough Mills Drumlins LCA;
- Central Ballymena Glens; and
- Long Mountain LCA

[27] LUC in association with Mullin Design Associates and Julie Martin Associates on behalf of Northern Ireland Environment Agency (2015) Northern Ireland Regional Landscape Character Assessment. https://daera-ni.maps.arcgis.com/apps/MapJournal/index.html?appid=dee491ff43c0415fbb986f74c92f39a9.

[28] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030 Preferred Options Paper, Discussion Paper 4: Landscape Character.

[29] NIEA (2010). Wind Energy Development in Northern Ireland's Landscapes Supplementary Planning Guidance to Accompany Planning Policy Statement 18 'Renewable Energy'.

100. The other LCAs in the 30 km Study Area are considered to not have potential to undergo a significant effect on landscape character as a result of the Development due to a combination of distance from the Development and lack of visibility, negligible visibility or limited visibility of the Development as shown on ZTVs and experienced in the field.

101. While the Scoping Request also identified a further four LCAs as being of relevance to the LVIA, subsequent desk-based studies and site work have shown that there would be very limited likelihood that a significant effect would arise in these LCAs as a result of the Development. The justification for discounting these LCAs from the detailed assessment is presented below.

102. The Dervock Farmlands LCA lies in the north-west of the Study Area at a range beyond 10 km from the Development. This is an agricultural landscape with small to medium sized fields laid out across a series of relatively low and undulating valleys. There is enclosure from hedgerows and tree belts and the character is largely rural and contained. The ZTV in **Figure 6.8** shows theoretical visibility to be mostly continuous with intermittent patches of no visibility largely localised on the north-west facing slopes of the valleys. There is no strong association between the Dervock Farmlands LCA and Slievenahanaghan Hill, where the Development would be located, with the wider hill upland ridge aligned at a perpendicular angle to these lower-lying valley landscapes. The combination of the limited association between these landscapes, their separation distance of beyond 10 km, the baseline influence of windfarm development in this location and the closer range influence of Altaveedan would moderate the potential magnitude of change and prevent the effects on landscape character from being significant.

103. The Ballymena Farmland LCA occupies a small section of the 15 km radius in the southern part of the Study Area. The ZTV in **Figure 6.8** shows visibility extending from 12 km across the western side of the LCA. This is a relatively low-lying and gently undulating agricultural landscape to the north-east of Ballymena. The location of the Ballymena Farmland LCA at the southern end of the upland ridge, which includes Slievenahanaghan Hill, combined with the extent of hills and valleys that occupy the intervening area, reduces the association between these two landscapes and in so doing, reduces the potential influence of the Development on the landscape character of the LCA.

104. The Moyle Glens LCA occupies the north-eastern part of the Study Area at distances beyond 8 km from the Development. The ZTV in **Figure 6.8** shows that there would be practically no theoretical visibility of the Development in this LCA and therefore there would be practically no effect.

105. The Garron Plateau LCA occupies the south-eastern part of the Study Area at distances beyond 7 km from the Development. The ZTV in **Figure 6.8** shows that there would be no visibility across the majority of the LCA with the exception of a large patch across the north facing slopes of the ridge through Carncormick, Mid Hill and Collin Top on the western edge of the LCA. Slievenahanaghan Hill, on which the Development would be located would be set behind the intervening hills of Slievenanee, Skerry Hill and Slieverush and this would reduce the association between these two landscapes and, in so doing, moderate the influence of the Development on the character of the LCA. The influence of operational windfarms on the baseline character of this LCA would also moderate the potential for a significant effect to arise, with Operational Corkey Windfarm and Gruig Windfarm located in the same area as the Development would be located and closer range Elginny Hill and Rathsherry presenting a closer range influence.

6.5.4 Landscape Planning Designations

106. Landscape-related planning designations are relevant to the LVIA in three ways:

- The presence of a designation can give an indication of a recognised value that may increase the sensitivity of a landscape character receptor, viewpoint or visual receptor, and may therefore affect the significance of the effect on that receptor.
- The presence of a relevant designation can lead to the selection of representative viewpoints within the designated area, as the viewpoints will provide representative outlooks from that area.
- Designated areas may be included as landscape character receptors so that the effects of the Development on these features of the landscape that have been accorded particular value can be specifically assessed.

107. The Site does not lie within any landscape planning designations. Three landscape-related planning designations are found in the 30 km Study Area: Area of Outstanding Natural Beauty (AONB), Area of High Scenic Value (AHSV) and Historic Gardens. These are described below and shown in **Figure 6.4** and in relation to the ZTV in **Figure 6.9**. The ASHV is not shown on Figure 6.9 because it lies outwith the 15 km radius.

6.5.4.1 Areas of Outstanding Natural Beauty

108. The Site lies on the western boundary of the Antrim Coast and Glens AONB, and this designation also covers the immediate landscape setting (up to 2km from the nearest turbine), the local landscape setting (between 2km and 5km from the nearest turbine), parts of the landscape setting (between 5km and 15km from the nearest turbine), and parts of the broad landscape context (between 15km and 30km from the nearest turbine) to the east, north-east and south-east of the Development (**Figure 6.9**).

109. The Antrim Coast and Glens AONB covers an extensive area encompassing much of the north-east coast of Northern Ireland and extending inland across the Antrim Hills and Glens. The western boundary broadly follows the western most ridgeline of the Antrim Hills, albeit omitting the hill summit of Slievenahanaghan, where the Operational Corkey Windfarm is located.

110. The Development lies close to the western boundary of the Antrim Coast and Glens AONB, and this designation also covers the immediate landscape setting (up to 2 km from the nearest turbine), the local landscape setting (between 2 km and 5 km from the nearest turbine), parts of the landscape setting (between 5 km and 15 km from the nearest turbine), and very limited parts of the broad landscape context (between 15 km and 30 km from the nearest turbine) to the east and north-east of the Development.

111. The AONB designation aims to protect and enhance the landscape quality of the area as well as to promote enjoyment of the landscape by the public. Whilst views from these locations will be of heightened sensitivity, windfarm development has not been prohibited from occurring within AONBs in Northern Ireland. In respect of the Antrim Coast and Glens AONB, the operational windfarms Altaveedan, Gruig, Rathsherry and Elginny Hill all sit on or close to the AONB boundary.

112. AONBs are designated by the Department of the Environment for Northern Ireland (DoENI) and are of national importance. The policy context for AONBs is described in 'Planning Policy Statement 2 Natural Heritage'[30], which states that AONBs are designated "*primarily for their high landscape quality, wildlife importance and rich cultural and architectural heritage*." Policy NH 6 is specifically worded for AONBs, and states that:

"*Planning permission for new development within an Area of Outstanding Natural Beauty will only be granted where it is of an appropriate design, size and scale for the locality and all the following criteria are met:*

a) the siting and scale of the proposal is sympathetic to the special character of the Area of Outstanding Natural Beauty in general and of the particular locality; and

b) it respects or conserves features (including buildings and other man-made features) of importance to the character, appearance or heritage of the landscape; and

c) the proposal respects:

- *local architectural styles and patterns;*
- *traditional boundary details, by retaining features such as hedges, walls, trees and gates;*
- *and local materials, design and colour*."

113. Explanatory text for this policy goes on to say the following:

"*This policy requires development proposals in Areas of Outstanding Natural Beauty (AONB) to be sensitive to the distinctive special character of the area and the quality of their landscape, heritage and wildlife.*

[30] Department of the Environment Northern Ireland (2013) Planning Policy Statement 2 Natural Heritage. Available online at: https://www.planningni.gov.uk/index/policy/planning_statements/pps2.htm [Accessed on 06/07/2017]

The quality, character and heritage value of the landscape of an AONB lies in their tranquillity, cultural associations, distinctiveness, conservation interest, visual appeal and amenity value."

114. It should be noted that the Development does not lie within an AONB and therefore will only affect the character through its visibility from within the AONBs. **Figure 6.9** and **Figure 6.13** illustrate that much of the area that is shown to have theoretical visibility of the Development, also currently has visibility of the Operational Corkey Windfarm, such that the extents of theoretical visibility would not notably increase. Despite the Development being located close to the AONB boundary, visibility of the turbines across the wider AONB area is restricted by the ridge of hills on which the Operational Corkey Windfarm is located and a higher ridge of hills to the immediate east. In views from the AONB operational windfarms are already visible to the immediate and more distant west, while there are no windfarm developments to the east.

115. Antrim Coast and Glens AONB is included as a landscape receptor in the assessment of effects on landscape character. The baseline context and effects on the AONB are assessed in **Sections 6.7.9 and 6.7.15** of this Chapter. This takes into account all relevant Landscape Character Assessments[31], SPG[32], and AONB Management Plans[33].

6.5.4.2 Areas of High Scenic Value (AHSV)

116. Areas of High Scenic Value are a local scenic designation, protected through policies contained in the relevant Local Plans. There is one AHSV in the 30 km Study Area, located towards the south, at a minimum distance of 22.5 km, shown to have no ZTV apart from low levels of visibility which occur beyond the 30 km radius. This AHSV is not included as a landscape receptor in the assessment of effects on landscape character, having been discounted through the scoping process and owing to very limited visibility of the Development.

6.5.4.3 Historic Gardens

117. The effects on visual amenity from publicly accessible Historic Gardens contained in the Register of Parks, Gardens and Demesnes of Special Historic Interest[34] have been considered within the LVIA. The effects on the Registered Properties as a cultural heritage asset have been assessed in Chapter 11: Archaeology and Cultural Heritage.

118. There are three Registered Gardens within 15 km of the Development and a further 32 in the 15 to 30 km range. The closest Registered Garden to the Development is Lissanoure at approximately 3.6 km to the north-west. Of the Registered Gardens and Supplementary Sites lying within a 15 km range, only Lissanoure has some public access reported in the Register.

119. Lissanoure is included as a landscape receptor in the assessment of effects on landscape character. The baseline context and effects on the Registered Garden are assessed in **Sections 6.7.10 and 6.7.16** of this Chapter.

6.5.5 Principal Visual Receptors

120. A number of visual receptors such as settlements and travel routes will be considered in the assessment as views from them may be affected by the Development. It is not possible to consider every potential visual receptor in the Study Area due to the extent of ground that it covers; therefore, the assessment concentrates on the 'principal' visual receptors that may gain visibility of the Development. Principal visual receptors are shown in **Figure 6.5** and in conjunction with the blade tip ZTV in **Figure 6.10**.

6.5.5.1 Settlements

121. The settlements considered in this assessment are drawn from the Settlement Development Limits (SDLs) dataset as provided by the Northern Ireland Statistics and Research Agency (NISRA). SDLs are a statistical classification and delineation of settlements in Northern Ireland as defined by the Planning Service. SDL boundaries are available for settlements with a population of greater than 1,000; therefore, the settlements included in this assessment are those that have a population of over 1,000 people. These are shown in **Figure 6.5** and in conjunction with the ZTV in **Figure 6.10**.

122. The central part of the 30 km Study Area, within the immediate and local landscape settings, comprises relatively sparsely populated rural landscapes with no SDL settlements occurring within the first 5 km radius of the Development. In the landscape setting, between 5 km and 15 km there are only two larger settlements; Clough Mills, approximately 5 km to the south-west of the nearest turbine and Dunloy, approximately 7 km to the west, both of which are shown on the ZTV to gain visibility of the Development. In the broad landscape context, Ballymoney at approximately 15 km to the north-west and Ballymena at approximately 17 km to the south are both larger towns, with visibility across Ballymoney shown on the ZTV to be almost continuous whilst only patchy visibility occurs across Ballymena.

123. Viewpoints have been selected to represent the visual amenity of residents in the closest settlements with potential to undergo significant effects. These include Clough Mills (Viewpoint 8), Dunloy (Viewpoint 10) and Ballymoney (Viewpoint 17). All of the other settlements have been discounted from the assessment through the scoping process, due to varying combinations of limited visibility and distance and are not assessed in any further detail (**Table 6.2**).

124. In addition to the settlements that are identified from the SDL dataset as described above, there are a number of smaller, dispersed communities that are not included as SDLs. Of these, the most relevant is Corkey (Viewpoint 1), as well as Lislaban (Viewpoint 2), Loughgiel (Viewpoint 4), Ballyweeny (Viewpoint 11), Altnahinch (Viewpoint 12) and Glarryford (Viewpoint 13). These viewpoints provide an indication of the type of visibility of the Development that is available from the dispersed rural communities that have higher visibility of the Development, and the assessment of effects on these viewpoints indicates the effects that are likely to arise.

6.5.5.2 Routes

125. Routes include roads, railway lines, national walking routes and national cycle routes. Routes included as principal visual receptors in the assessment are determined by four criteria:

- The proximity of the route to the Development;
- The extent to which the route traverses the 30 km Study Area or extends across a notable part of it;
- The importance of the route in terms of recognition, volume of users and usage; and
- The potential for the Development to contribute to cumulative effects along the route.

6.5.5.2.1 Roads

126. The location and extent of roads in the 30 km Study Area reflects the landform pattern as they follow the accessible low-lying valleys, and upland areas are considerably less accessible by road. The roads in the 30 km Study Area that are considered as principal visual receptors, due to various combinations of the criteria listed above, are as follows:

- A26: runs south to north-west across the western part of the 30 km Study Area, a minimum of approximately 5km to the west of the Development;
- B94: runs to the south and west of the Development, a minimum of approximately 6 km to the east of the Development;
- B16: traverses the eastern flank of Long Mountain, a minimum of approximately 6 km to the west of the Development.

127. The effects on these roads are considered in the detailed assessment subsequently in this Chapter.

6.5.5.3 Walking Routes

128. Walking routes included in the assessment are those that have national status. There is one relevant route in the Study Area for the Development; the Moyle Way, which enters the northern edge of the 30 km Study Area near Ballycastle Forest and passes along the valley of the Glenshesk River, to the north of the Development, before ascending over Slieveanorra to the north-east of the Site and Trostan to the east. ZTVs indicate that there is potential for significant effects to arise on views from this upland section as it passes within approximately 5 km of the Development and it is therefore included in the detailed assessment subsequently in this chapter.

129. Locally-promoted walking routes are not included as specific receptors in the assessment due to the more limited level of recognition and importance afforded to them. However, there are several assessment viewpoints located on local walking routes and where this is the case, the recognition of the route is taken into consideration in the assessment of the sensitivity of The viewpoint, which will generally be heightened by its recognition.

6.5.5.4 Viewpoints

130. **Table 6.4** presents the final list of viewpoints. These have been identified through reference to the ZTV with viewpoints shown in **Figure 6.6a** and **Figure 6.6b** and have been agreed with the Council during the scoping process. In selecting viewpoints, a

[31] Department of Agriculture, Environment and Rural Affairs (2000). The Northern Ireland Landscape Character Assessment.
[32] NIEA 2010. Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance (SPG) to accompany Planning Policy Statement 18 Renewable Energy.
[33] Causeway Coast and Glens Heritage Trust (2008). Antrim Coast and Glens AONB Management Plan 2008-2018
[34] Available online at: https://www.communities-ni.gov.uk/articles/historic-parks-gardens-and-demesnes

range of receptor types and distances has been sought. Those viewpoints marked with an asterisk are those considered to be most important in relation to the design of the windfarm layout, since most represent static and/or close-range receptors.

131. The assessment of landscape and visual effects is informed by a series of viewpoints which are selected to illustrate visibility from landscape character types, landscape planning designations and principal visual receptors around the Study Area. These include points of specific importance such as recognised viewpoints, settlements, important routes and attractions.

132. It is important to note that assessments of this type tend to focus on those locations and receptors where significant effects may arise, and in this assessment almost all of the viewpoints have been selected to represent areas of high visibility of the Development. It is somewhat inevitable that locations for the majority of viewpoints are located where there is a prominent view of the Site, and it is important that these are covered. But it is also important to record that the viewpoints are not always representative of the general outlook in their vicinity or from the wider Study Area. There are large parts of the 30 km Study Area where ZTVs show that there will be no visibility of the windfarm at all or where the theoretical visibility as shown on the ZTV may only relate to a single turbine, or even part of a turbine blade and this should be taken into consideration in the review of the viewpoint assessment.

133. The viewpoint assessment is used to inform and illustrate the assessment of effects on landscape character as well as the assessment of effects on views and principal visual receptors. The viewpoints used in the assessment are listed in **Table 6.4**, which also indicates those receptors the viewpoints are representative of. The potential significant effects are expanded upon subsequently in this Chapter.

Table 6.4: Representative Viewpoints

No.	Viewpoint	Grid Reference	Distance (km)	Representative
1*	Corkey	309097 / 421409	1.68	Representative of residents, pedestrians and road-users.
2*	Lislaban	308202 / 419411	3.57	Representative of residents, pedestrians and road-users.
3*	Reservoir Road	309568 / 422296	1.15	Representative of residents and road-users.
4*	Loughgiel	307614 / 424781	3.88	Representative of residents, pedestrians and road-users.
5*	Altnahinch Road south	315035 /421400	3.58	Representative of road-users.
6*	Altnahinch Reservoir	312044 / 423203	1.26	Representative of recreational-users.
7*	Slieveanorra	313455 / 426627	4.88	Representative of recreational users.
8	Ballycregagh Road, Clough Mills	307054 / 417109	6.07	Representative of residents, pedestrians and road-users.
9	B94 over A26 west of Clough Mills	305215 / 418372	6.55	Representative of residents, pedestrians and road-users.
10	Tullaghans Road, Dunloy	301009 / 419335	10.02	Representative of residents, pedestrians and road-users.
11*	Ballyweeny, Ballyveely Road	306995 / 421835	3.68	Representative of residents, pedestrians and road-users.
12	Altnahinch Road north	310360 / 424965	2.55	Representative of residents and road-users.
13	Cemetery near Glarryford	305283 / 413254	10.26	Representative of residents, pedestrians and visitors.
14	Kilmandil Road	305419 / 421163	5.32	Representative of residents and road-users.
15	Slemish	322168 /405400	19.75	Representative of recreational-users.
16	A26 west of Clogh	306394 / 413194	9.73	Representative of road-users.
17	A26 south-east of Ballymoney	299148 / 424119	11.69	Representative of residents, pedestrians and road-users.
18	Boghill, Long Mountain	300871 / 415538	11.73	Representative of residents, pedestrians and road-users.

6.5.6 Cumulative Windfarms

134. The cumulative context comprises other commercial windfarms of various scales, as well as single and paired turbines. The windfarms are shown in **Figure 6.12** with turbines less than 50 m mapped where they lie within a 5 km radius of the Development. Gruig Windfarm lies on the same hill ridge as Operational Corkey Windfarm and the Development, abutting the Site to the immediate south. The relationship between these two developments is an important factor in the assessment of cumulative effects. Operational Altaveedan Windfarm lies approximately 4 km to the north, also on the western edge of the Antrim Hills. On Long Mountain Ridge, that runs parallel to the Antrim Hills, on the opposite side of Main Valley, there occurs a cluster of three operational windfarms, all at a range of 11 to 13 km; Long Mountain, Garves and Glenbuck I and II. These have potential to contribute to cumulative effects experienced in the intermediate valley. At a range of 10 to 12 km and to the south of the Operational Corkey Windfarm, there are two operational windfarms; Rathsherry and Elginny Hill, although as shown on **Figures 6.19** and **6.20**, the extent of theoretical inter-visibility with the Development would be limited.

135. A cumulative Study Area radius of 30 km has been agreed with statutory consultees through the scoping process. The cumulative assessment includes windfarms that are operational, consented, and planning applications. Scoping stage windfarms are not generally included unless they are in close proximity to the Development and therefore of notable relevance. In this case, no scoping sites are considered to be relevant for inclusion in the cumulative assessment.

136. The cumulative situation changes frequently as applications are made or withdrawn, and the layouts of submitted application windfarms are changed. It is therefore necessary to decide on a cut-off date when the sites and layouts to be included are fixed. 20th May 2019 has been used as a cut-off for this cumulative assessment, and any changes in the cumulative situation after this date are not incorporated in the assessment.

137. Windfarm sites that lie within a 30 km radius of the Development are shown in **Figure 6.12** and are listed in **Table 6.5** below. The relevance of each cumulative development to the cumulative assessment is noted in the end column.

Table 6.5: Windfarm sites within 30 km of the Development

Windfarm Name	Status	No. Turbines	Tip Height (m)	Distance from Closest Development Turbine	Relevance to LVIA
Altaveedan	Operational	9	101	3.9 km	Relevant – nine turbine windfarm at relatively close range.
Ballybogie Hill	Operational	1	61	5.9 km	Limited relevance – single turbine just beyond 5 km radius.
Ballymena	Operational	2	120	17.1 km	Limited relevance –two turbines at middle range.
Cloonty	Operational	4	110	18.7 km	Limited relevance –two turbines at middle range.
Connaught Road	Operational	2	70	29.0 km	Not relevant – two turbines close to edge of 30 km Study Area.
Coolkeeran Road (100)	Operational	1	44	5.2 km	Limited relevance – single turbine <50 m close to 5 km radius.
Coolkeeran Road (134)	Operational	2	34.2	4.9 km	Limited relevance – single turbine <50 m close to 5 km radius.
Corby Knowe	Operational	3	99.5	28.5 km	Not relevant – only three turbines close to edge of 30 km Study Area.
Corkey Road (145/1)	Operational	1	35	2.8 km	Limited relevance – single turbine <50 m.
Corkey Road (163)	Operational	1	35	2.3 km	Limited relevance – single turbine <50 m.
Corkey Road (99)	Operational	1	35	2.6 km	Limited relevance – single turbine <50 m.
Drumbare Road (29)	Consented 2017	1	67	6.2 km	Limited relevance – single turbine beyond 5 km radius.
Elginny Hill	Operational	10	100	11.2 km	Limited relevance – cumulative ZTV in Figure 6.20 shows limited theoretical inter-visibility.
Elliots Hill	Operational	10	58.5	27.0 km	Not relevant – close to edge of 30 km Study Area.
Garves	Operational	5	125	11.4 km	Relevant – middle range and part of windfarm cluster.
Glenbuck	Operational	1	120	11.3 km	Relevant – middle range and part of windfarm cluster.
Glenbuck II	Operational	3	109	11.3 km	Relevant – middle range and part of windfarm cluster.
Gruig	Operational	10	100	0.7 km	Relevant – ten turbine windfarm at very close range.
Gruig Lane (15)	Operational	1	43.5	2.1 km	Relevant – single turbine <50m but within close range.
Long Mountain	Operational	12	100	10.8 km	Relevant – middle range and part of windfarm cluster.
Loughgiel Community Ass.	Operational	1	Unknown	4.2 km	Relevant – single turbine <50m but within 5 km radius of Study Area.
Moneyduff Road (15)	Operational	1	57	5.1 km	Limited relevance – single turbine >50 m and just beyond 5 km radius.
Moneyduff Rd (46)	Operational	1	35	4.3 km	Limited relevance – single turbine <50 m.
Omerbane Road (24)	Operational	1	54.5	3.5 km	Limited relevance – single turbine >50 m.
Omerbane Road (31)	Operational	1	43.5	3.5 km	Limited relevance – single turbine <50 m.
Omerbane Road (29)	Operational	1	43.5	4.2 km	Limited relevance – single turbine <50 m.
Reservoir Road (21)	Operational	1	67	0.4 km	Relevant – single turbine within very close range.
Reservoir Road (15)	Operational	1	48	0.8 km	Relevant – single turbine <50m but within very close range.
Rathsherry	Operational	9	105	10.4 km	Limited relevance –cumulative ZTV in Figure 6.19 shows limited theoretical inter-visibility.
Sheltin Road	Operational	1	24.5	3.5 km	Limited relevance – single turbine <50 m.
Wolf Bog	Operational	5	97.5	27.1 km	Not relevant – close to edge of 30 km Study Area.
Ballykeel	Consented 2016	7	99.5	29.1 km	Not relevant – close to edge of 30 km Study Area.
Ballyveely Road (96)	Consented 2016	1	47.5	4.5 km	Limited relevance – single turbine <50 m.
Cam Burn	Consented 2016	6	120	27.4 km	Not relevant – close to edge of 30 km Study Area.
Castlegore	Consented - 2016	4	125	26.3 km	Not relevant – close to edge of 30 km Study Area.
Corkey Road (18)	Consented 2014	1	34.2	2.9 km	Limited relevance – single turbine <50 m.
Corkey Road (8)	Consented 2011	1	43.5	3.3 km	Limited relevance -single turbine <50m and out of date consent.
Corkey Road (108)	Consented 2013	1	45.6	2.0 km	Limited relevance - single turbine <50m and out of date consent.
Corkey Road (237)	Consented 2013	1	47	2.7 km	Limited relevance - single turbine <50m and out of date consent.
Corkey Extn.	Consented 2012	1	100	1.0 km	Limited relevance -single turbine and out of date consent.
Corkey Road (145/2)	Consented 2014	1	66	2.8 km	Limited relevance – single turbine.
Craig 1	Consented 2014 consent	1	126	15.0 km	Limited relevance – single turbine at middle range.
Craig 2	Consented 2017	1	126	14.9 km	Limited relevance – single turbine at middle range.

Windfarm Name	Status	No. Turbines	Tip Height (m)	Distance from Closest Development Turbine	Relevance to LVIA
Drones Road (250)	Consented 2013	1	54	5.1 km	Limited relevance -single turbine just beyond 5 km radius and out of date consent.
Gruig Lane (12)	Consented 2013	1	55	2.4 km	Limited relevance – singe turbine and out of date consent.
Loughill Road (48)	Consented 2012	1	Unknown	4.9 km	Limited relevance -single turbine and out of date consent.
Moneyduff Road (35)	Consented 2013	1	60.7	4.8 km	Limited relevance -single turbine and out of date consent.
Tullykittagh Road 1 (58)	Consented 2013	1	55.7	3.5 km	Limited relevance -single turbine and out of date consent.
Tullykittagh Road 2 (48)	Consented 2014	1	55	3.3 km	Limited relevance – single turbine.
Whappstown	Consented	4	120.5	26.2 km	Not relevant - close to edge of 30 km Study Area.
Armoy	Application	6	149.9	8.7 km	Limited relevance - cumulative ZTV in Figure 6.22 shows limited theoretical inter-visibility.
Ballyveely Road (99)	Application	1	52	3.2 km	Limited relevance - single turbine close to 5 km radius.
Carnalbanagh	Application	7	125	19.1 km	Not relevant – cumulative ZTV in Figure 6.21 shows limited theoretical inter-visibility.

138. Cumulative ZTVs that show the visibility of the relevant sites along with the visibility of the Development have been included for all of the relevant windfarms (Figures 6.14 to 6.22) using a 30 km radius for each. The relevant cumulative sites are also shown in the wirelines (Figures 6.23 to 6.40) for each of the representative viewpoints. In these wirelines, the Development turbines are shown in red, operational and under construction windfarms are indicated in black, consented windfarms are shown in green, and proposed windfarms that are the subject of planning applications or at appeal are coloured blue. The wirelines are produced in increments of 90-degrees and cover a variable width of the view, ranging from 90-degrees to 360-degrees, dependent on the horizontal field of view that has been used for each viewpoint.

139. In some instances, windfarms appear in the wirelines although they are beyond their own Study Area radius. Where this occurs, the windfarm is not included in the assessment as it is considered to lie beyond the radius within which it may contribute to a significant cumulative effect.

140. In this assessment, windfarms that are operational or under construction are considered as 'baseline' windfarms and assessed as part of the main assessment. There is less certainty that consented and application stage windfarms will be constructed and these are, therefore, not included in the main assessment. The most relevant windfarms to this assessment are the operational windfarms which lie within a 15 km radius of the Development and the cumulative effect of the Development in conjunction with these is assessed in the main assessment in **Sections 6.7** and **6.8.**

141. There is a concentration of single and paired operational and consented turbines within a 5 km radius of the Development. The operational turbines are considered in the main assessment in **Sections 6.7** and **6.8**. The consented turbines are considered in the following paragraphs. Table 6.5 highlights a number of common attributes of the consented turbines. Firstly, all of the 11 consented developments comprise a single turbine. Secondly, five of the turbines are less than 50m to blade tip, three are less than 60m, one less than 70m and one at 100m, while the blade tip height of the remaining one is unknown. Collectively, all these turbines are relatively small. Thirdly, the consent attached to nine of the 11 turbines appears to have lapsed, owing to consent being granted more than 5 years ago and no readily apparent evidence from the public domain that any of these turbines have been built. This reduces the likelihood of these turbines being constructed, and a new application would need to be submitted and consented by the relevant planning authority before construction could take place. Despite the absence of any readily apparent evidence, there may be evidence on the ground that construction work has started to some extent. This would mean that the consent had been implemented, despite the construction works not being completed. For this reason, these consented turbines cannot be completely discounted from the assessment as there is the possibility, no matter how unlikely, that the consents have been implemented through the start of construction works and therefore could potentially still be live.

142. The map of cumulative developments in Figure 6.12 illustrates how the majority of the consented turbines are located within the western half of the first 5 km radius. While the concentration of consented single turbines adds to the extent of development within the lower-lying agricultural landscapes, they have a limited influence on the cumulative situation, which is more notably influenced by the other larger commercial windfarm developments located in the upland landscape. The single turbines are associated with the valley landscape and while they form part of the wider landscape setting, they do not form a direct association with the Development. Furthermore, occurring as only one or two turbines, their horizontal extents are limited and this further reduces their influence on the cumulative situation. It would therefore be unlikely for a significant cumulative effect to arise in respect of the addition of the Development to a cumulative context comprising these single consented turbines and for this reason this cumulative scenario has been discounted from this assessment.

143. Although there are a small number of consented turbines located on the western side of the upland area, in contrast to the valley landscape, the upland landscape would continue to be characterised by the larger scale windfarms which are a feature associated with Slievenahanaghan Hill in particular. It is in respect of this cumulative context that the addition of the Development would have a limited cumulative effect. While it would be seen as a larger development in comparison with the smaller scale developments of the valley landscape, this would be in-keeping with the established pattern of windfarm development in this area and would reflect the greater capacity of the upland landscape to accommodate larger developments, due to the scale of the landscape. It can therefore be concluded, that even if all the consented single turbines were built, the addition of the Development to this cumulative scenario would be unlikely to give rise to significant cumulative effects, largely owing to the clear distinction between the size and scale of these developments and their location in and association with the landscape.

144. All other consented windfarms that lie beyond the 5 km radius have been discounted from the cumulative assessment owing to their very limited influence on the cumulative situation, often as a result of their occurrence as single or paired turbines, their relatively small scale and their closer association with the settled and cultivated landscape of Main Valley, rather than the adjacent upland landscape where the Development would be located. Ballykeel, Cam Burn, Castlegore and Whappstown are the four consented windfarms, and while, owing to the larger number and size of turbines, they have greater potential to influence the cumulative situation, their location out towards the periphery of the 30 km means that are not relevant to the cumulative assessment of the Development.

145. There are only two application windfarms within the 30 km radius, Armoy at approximately 8 km to the north and Carnalbanagh at approximately 18 km to the south-east. As the cumulative ZTVs in **Figures 6.21** and **6.22** show, there is limited inter-visibility between the Development and each of these application windfarms, and this reduces their relevance to the cumulative assessment. There is also an application at Ballyveely Road, although the additional influence on the cumulative assessment, of this single turbine at 52m,would also be limited. For these reasons the application windfarms and turbines have been discounted from the cumulative assessment.

6.5.7 Trends and Projected Future Baseline

146. The most notable changes which are occurring throughout the 30 km Study Area are the increase in windfarm developments and the felling and replanting of coniferous forestry.

147. Figure 6.12 shows the extent of operational, under construction and consented windfarm developments, as well as those at application stage and in scoping. There is a growing acceptance that turbines are becoming larger in response to improved technology. This trend also reflects the drive to reduce the levelised cost of energy by utilising more efficient and robust turbines. Repowering projects will become increasingly evident across Northern Ireland as many of the earliest and smallest turbines are replaced by larger and more productive models. In some areas this has already resulted in variances in scale between older, smaller turbines and newer, larger turbines and this will continue to be an established baseline feature of the landscape.

148. Forestry comprises a substantial part of the landcover across the 30 km Study Area, especially in the Moyle Moorland and Forest LCA of the Antrim Hills. In the 'Scoping a new forestry plan for Antrim area forests and woodlands', produced by the Forest Service, one of the aims is to 'identify potential for promoting woodland expansion adjacent to Forest Service forests, where appropriate.' The large area of forestry that covers the upland landscape to the east of the Site is a Forest Service forest and its potential expansion could potentially further reduce the openness of the few moorland areas in this landscape.

149. In terms of Climate Change, the Stern Review[35] states 'The scientific evidence is now overwhelming: climate change is a serious global threat, and it demands an urgent global response.' A warmer and wetter climate in Northern Ireland will mean greater risk of flooding in low-lying parts of the landscape, which in the Study Area, largely coincides with areas of farmland, where improved pasture is the predominant land use. While it will also mean an incremental rise in sea level, the predictions for more frequent stormy weather could lead to coastal settlements being affected by flooding during high tides.

6.6 Potential Effects and Residual Effects

6.6.1 Potential Effects

150. Potential effects are those which could result from the construction, operation and decommissioning of a windfarm, as set out in **Table 6.6**. It should be noted that their inclusion does not imply that they would occur, or if they do, that they would give rise to significant effects. A variety of landscape and visual mitigation measures have been incorporated through the iterative design of the Development in order to prevent, reduce or offset potential landscape and visual effects. These are described in **Section 6.4.4** and **Chapter 4: Site Selection and Alternatives**. The residual effects of the Development – those effects remaining after mitigation that will arise when the Development is under construction, operation or decommissioning - are assessed in **Sections 6.7** and **6.8**.

Table 6.6: Potential Landscape and Visual Effects

Activity	Specific Element	Potential Effects	Potential Sensitive Receptors
Construction of Development and decommissioning of Operational Corkey Windfarm	Construction plant, temporary construction facilities, meteorological mast, substation, external transformers, battery storage, construction cranes and access	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views Temporary cumulative effects	Physical landscape features e.g. trees and ground cover Landscape character receptors – landscape character types, wild land areas and designated landscapes Views – experienced by different receptors e.g. residents, road users, walkers
Operation	Turbines, access tracks, meteorological mast, substation, site office, external transformers, battery storage	Long term effects on landscape character Long term effects on views Long term cumulative effects with other windfarms	
Decommissioning	Construction plant, cranes	Temporary physical effects on landscape fabric Temporary effects on landscape character Temporary effects on views	

151. The effects on landscape and visual receptors would arise principally from the combined decommissioning and construction phase of the turbines and associated infrastructure and then the operation of the turbines. The temporary decommissioning and construction facilities, such as cranes, construction vehicles, construction compounds, laydown areas and delivery vehicles required during the decommissioning and construction phase would also have effects on the landscape and visual resource. It is anticipated that the combined decommissioning of Operational Corkey Windfarm and construction of the Development would take approximately 8 months, and therefore the construction effects identified are predicted to occur during this period and end at the start of the operational stage.

6.6.2 Residual Effects

152. The residual effects (i.e. those which remain after mitigation) that the Development will have on the landscape and visual resource are assessed in the following three sections; physical effects, effects on landscape character, and effects on views. The assessment of cumulative effects is incorporated into these assessments.

[35] Stern, N. (2006). "Stern Review on the Economics of Climate Change Executive Summary". HM Treasury, London.

6.7 Effects on Landscape

6.7.1 Physical effects

153. The first category of effects on landscape covered in the assessment is physical effects, which are direct effects on the fabric of the Site, such as the removal of ground cover vegetation. Physical effects are found only on the Site, where existing landscape elements may be removed or altered by the Development. This category of effects is made up of landscape elements and, in this case, there is one element involved, rough grass moorland. The construction of turbine bases, access tracks and other infrastructure would require the removal of areas of rough grass moorland ground cover. The methodology for the assessment of physical effects is described in full in **Technical** Appendix A.6.1.

6.7.2 Rough grass moorland

6.7.2.1 Baseline

154. Rough grass moorland is the predominant landcover across the Site. It comprises rough grasses and heathers growing in wet, boggy ground. This type of landcover is typical throughout much of the Moyle Moorlands and Forests LCA.

155. The sensitivity of the landscape element is determined through a combination of the value attached to it and its susceptibility to the Development. The value of rough grass moorland is medium. While it is a relatively widespread landscape element that is not rare or specifically recognised for its value, it is also a highly characteristic element of the landscape that covers the Site and surrounding areas and contributes to the exposed, open character of the unforested parts of the Site and its surroundings. There is also value in the contrast that rough grass moorland has with the semi-improved and improved grassland that is found in the adjacent settled landscapes such as throughout the Main Valley, as this variation in ground cover is one of the indicators of the difference between the upland and lowland character types.

156. The susceptibility to change of this landscape element is medium to low due to the potential for reinstatement and restoration of the ground cover following decommissioning of Operational Corkey Windfarm, construction of the Development and at the end of the lifetime of the proposed Development. The combination of the medium value and medium to low susceptibility to change of the landscape element results in a **medium** sensitivity for rough grass moorland ground cover.

6.7.2.2 Magnitude of Change

157. The area of rough grass moorland to be removed or disturbed in the construction and operation of the Development is limited in relation to the total area found on the Site and beyond. The construction and operation of a new junction at Reservoir Road and access track from north-west to south-east into the Site, would require an area of rough grassland to be removed. The section of existing track from the south-west to north-east, which leads into the Operational Corkey Windfarm, would be re-used for the Development, although it would need to be widened. Earthworks would be required across the north-eastern side of the Site in order to build up the ground levels under Development turbines T2 and T3 and here the rough grass moorland would also be removed. In order to construct and access the new layout of five turbines, new access tracks would need to be constructed across the hilltop, along with crane pads and foundations, and this would lead to further losses of rough grassland, albeit only over relatively small areas.

158. As part of the combined decommissioning and construction phase, rough grass moorland would be reinstated where infrastructure would be removed. Rough grasses can be re-established with relative ease and this would moderate the magnitude of change, as this landscape element could be relatively easily restored.

159. In relation to the overall area, the magnitude of change arising from the rough grass moorland removals during decommissioning of Operational Corkey Windfarm and construction, operation and decommissioning of the Development is considered to be **medium to low**. Rough grasslands would be reinstated in those areas where infrastructure would be removed.

6.7.2.3 Significance of the Effect

160. The effect of the Development on rough grass moorland would be **not significant** during the decommissioning of Operational Corkey Windfarm and construction, operation and decommissioning of the Development. This is due to the limited sensitivity of the landscape element to the Development, the limited proportion of the wider area that would be affected and the relative ease with which the rough grass moorland that would be affected.

6.7.3 Summary of Physical Effects

161. The Development would affect only one landscape element, namely, rough grass moorland ground cover and the effect would be **not significant** during the initial decommissioning / construction, and operational phases.

6.7.4 Effects on Landscape Character

162. Landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and the way that this pattern is perceived. Effects on landscape character occur both on the Site, where the pattern of elements that characterises the landscape would be directly altered by the addition of the Development to the landscape; and off-site, around the Study Area, where visibility of the Development may alter the way in which this pattern of elements would be perceived. For example, if the Development is visible from an area of Long Mountain Ridge LCA, the perceived experience of this area may be altered as visibility of the Development introduces different contextual characteristics despite its physical location in another, separate area.

163. It should be noted that levels of magnitude of change on landscape character receptors are generally found to be lower than the magnitude of change on viewpoints that lie within these landscape character areas. This means, for example, that if a viewpoint is assessed to undergo a medium to high magnitude of change it does not necessarily follow that the landscape character area within which it lies would also undergo a medium to high magnitude of change but may undergo a medium magnitude of change instead.

164. This is because the effects on viewpoints are assessed within the context of a specific outlook of the Development and are usually specifically selected to gain a direct view over the Site. The landscape character of a receptor is not necessarily determined so specifically by the outlook over the Development, and there are many other considerations, both visual and perceptual, that may combine to give an area its landscape character. This means that the Development may have a lesser degree of influence on landscape character than on a specific view. This is particularly true of areas that lie slightly further away from the Development. In the ´Immediate Landscape Setting´ of the Site, covering a radius of 2 km, the magnitude of change on viewpoints and landscape character is likely to be similar, but beyond this, the magnitude of change on landscape character is found to often diminish more rapidly as the influence of the turbines is subsumed in the many other influences on landscape character. Viewpoints are referred to in this assessment as they do give a useful indication of the appearance of the Development from specific locations within the various landscape receptors, but the level of magnitude of change may vary between the viewpoint assessment and the landscape character assessment.

165. Furthermore, the presence and baseline influence of Operational Corkey Windfarm on the Site, also moderates the potential effects of the Development, as it would not be introducing a new or unfamiliar feature into this landscape, but instead would be replacing an existing development with a similar type of development, reducing the number of turbines from ten to five, albeit with turbines of larger dimensions. The magnitude of change on surrounding landscape and visual receptors would, therefore, not be as pronounced as if there was no existing influence from windfarm development on this Site.

166. The assessment of effects on landscape character covers two groups of receptors, LCAs and landscape planning designations. **Section 6.5** Baseline Conditions identifies the landscape character receptors which have the potential to undergo significant effects and significant cumulative effects as a result of the Development and therefore require further assessment. **Section 6.5** also describes the requirement of the SPG to assess the effects on landscape character in terms of the distance bands; Immediate Landscape Setting (0 to 2 km), Local Landscape Setting (2 to 5 km) and Landscape Setting (5 to 7 km). The relevant LCAs and their associated distance bands are as follows:

- Moyle Moorlands and Forest LCA (Immediate Landscape Setting / Local Landscape Setting / Landscape Setting);
- Cullybackey and Clough Mills Drumlins LCA (Local Landscape Setting / Landscape Setting);
- Central Ballymena Glens LCA (Local Landscape Setting / Landscape Setting);
- Long Mountain Ridge LCA (Landscape Setting);
- Antrim Coast and Glens AONB (Immediate Landscape Setting / Local Landscape Setting / Landscape Setting); and
- Lissanoure RG (Local Landscape Setting).

167. Baseline descriptions and sensitivity ratings for each of these landscape receptors is presented below, while a detailed assessment of the effects of the Development is presented in **Section 6.7.12** to **6.7.14**.

6.7.5 Moyle Moorlands and Forest LCA

6.7.5.1 Baseline

168. The Moyle Moorlands and Forest LCA covers the north east sector of the 30 km Study Area as shown in **Figure 6.3**. It is characterised by the upland landscape of the Antrim Hills which comprises hills ranging in size between 350 m and 550 m. These hills align from north-west to south-east, with the lowlands of River Main to the west and the Antrim Glens to the east. Groups of gently undulating hills merge to form areas of upland plateau which collectively form a distinctive ridgeline especially when viewed from the west or east.

169. The landcover comprises a mix of grassland and forestry. The grassland is mostly unenclosed rough moorland containing areas of blanket bog, parts of which have been cut for peat. Enclosed fields of semi-improved grassland occur in the more sheltered valley of the Bush River. In contrast, extensive tracts of coniferous forestry have been cultivated in large blocks of single species and single age. They form enclosure across much of this upland landscape, with their often geometric layout failing to reflect the organic shape of the landform.

170. Settlement in this LCA is confined to the sheltered valleys and lower margins of the moorlands. There is no development in the uplands of this landscape other than abandoned cottages, farm buildings and windfarms. A series of windfarm developments occupy the western margins of this LCA with Operational Corkey Windfarm on Slievenahanaghan Hill, and Gruig Windfarm to the south and Altaveedan to the north. These developments form a distinctive feature in views of the ridgeline from the west and east.

6.7.5.2 Sensitivity

171. The value of the LCA is medium to high. This LCA is covered by the national landscape designation of the AONB which denotes the national importance of the landscape. The value is however moderated by the presence of extensive commercial forestry which has modified the landscape from its natural state.

172. The susceptibility of the LCA to the effects of the Development would be medium. The susceptibility is moderated by the presence of extensive commercial forestry plantations and Operational Corkey Windfarm in this LCA, as well as Gruig Windfarm to the south and Altaveedan to the north. These windfarms establish this type of development as part of the baseline character. While this means the Development would not add a new type of influence to the character of the LCA, the larger scale of its turbines would mean that it would increase the influence and this in turn increases the susceptibility.

173. The combination of the value of the LCA and its susceptibility to the Development would give rise to an overall **medium to high** sensitivity rating.

6.7.6 Cullybackey and Clough Mills Drumlins LCA

6.7.6.1 Baseline

174. This LCA covers a broad lowland area, enclosed by Long Mountain Ridge to the west and the Antrim Hills to the east. Within this LCA there is a watershed between the River Main which flows south to Lough Neagh and the Bush River which flows north to the north coast. The landform is gently undulating with a gradual fold in towards the valley floors. Drumlins form a distinctive feature alongside the River Main on account of their small hummocky landform, their steep sides, intermittent troughs and hollows and their alignment from north-west to south-east.

175. This LCA is cultivated, with small to medium sized fields of predominantly improved pasture enclosed by hedgerows, stone walls and post and wire fences. This LCA is also settled, with the dispersed pattern of settlement across the landscape reflecting the fragmented land ownership pattern. As well as the traditional farmsteads and modern farm complexes, there are many individual and clustered groups of properties and small villages, but only a few towns, including Cloughmills. While there are no commercial scale windfarms present in this LCA, there are a number of single and paired turbines, mostly associated with the valley farmsteads.

176. Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm are visible on the ridge of the Antrim Hills which enclose the east side of the valley. The extent to which these developments influence this LCA relates to the variable separation distance from a minimum of approximately 1.8 km to beyond 15 km, and the extent of enclosure, with their influence reduced in those parts enclosed by localised landform, tree cover, hedgerows and built form and their influence increased in those parts which are more elevated and open.

6.7.6.2 Sensitivity

177. The value of this LCA is medium. It is not covered by any national or regional landscape planning designations which would otherwise denote a recognised scenic value.

178. The susceptibility of the LCA to the effects of the Development is moderated by the influence of the existing single and paired turbines within this LCA and operational turbines in the adjacent Antrim Hills and Long Mountain Hills. While the susceptibility of this LCA would be reduced by the introverted nature of parts of this landscape, it would be raised by the prominence and influence of the Antrim Hills in the more and exposed parts. While this LCA has been extensively modified by agricultural practices, the retention of a well-defined pattern of enclosure adds to the rural character.

179. The combination of the value of the LCA and its susceptibility to the Development would give rise to an overall **medium** sensitivity rating.

6.7.7 Central Ballymena Glens LCA

6.7.7.1 Baseline

180. This LCA is located to the south of the more elevated Moyle Moorlands and Forest LCA and to the west of the Garron Plateau LCA. The result is a landscape characterised by the broad undulating glens formed by the water courses running off these neighbouring uplands. Close to the uplands, the glens are narrow and incised, the burns rocky and fast flowing and the tree cover deeper and denser. Towards Ballymena, the glens broaden, the water courses meander more and the tree cover thins. Between the glens, the landform rises into undulating ridges and there is some sense of local enclosure, while the broader enclosure is formed by the more elevated moorland landscapes to the north and east.

181. In contrast to the open moorlands to the north and east, the Central Ballymena Glens LCA presents a more settled and cultivated landscape, where farm fields of mostly improved pasture are defined by the enclosure of stone walls, hedgerows and post and wire fences. Settlement is typically dispersed, small-scale and rural in character. Clusters occur in the form of villages where traditional white cottages are a characteristic feature.

182. There are currently no windfarms in this LCA although consented Rathsherry and Elginny Hill Windfarms are planned for the southern part of this LCA. Operational Corkey Windfarm and Gruig Windfarm are located in Moyle Moorlands and Forest LCA to the north. Their influence on the character of the Central Ballymena Glens LCA is, however, reduced by the juxtaposition between these two landscapes, whereby the Moyle Moorlands and Forest LCA forms a north-west to south-east ridgeline, which has a stronger influence along the broad sides to the west and east and a lesser influence along the short sides to the north and south. There is also intervening upland landform which separates these windfarms from the LCA which further moderates their influence.

6.7.7.2 Sensitivity

183. The value of this LCA is medium. It is not covered by any national or regional landscape planning designations which would otherwise denote a recognised scenic value. This is with the exception of a small part of the eastern edge which is covered by the Antrim Coast and Glens AONB. While this LCA has been extensively modified by agricultural practices, the retention of a well-defined pattern of enclosure adds to the rural character and value.

184. The susceptibility of the LCA to the effects of the Development is moderated by the juxtaposition between the Antrim Hills to the north, where the Site is located and the Central Ballymena Glens to the south, which reduces the association between these two landscapes. While the susceptibility of this LCA would be reduced by the introverted nature of parts of this landscape, in more open parts there would be a more notable influence.

185. The combination of the value of the LCA and its susceptibility to the Development would give rise to an overall **medium** sensitivity rating.

6.7.8 Long Mountain LCA

6.7.8.1 Baseline

186. This LCT is characterised by a long ridge of land that runs from Ballymoney in the north to Randalstown in the south. It has been created by the erosion of the valleys of the River Bann to the west and the River Main to the east. The valley sides are gently undulating while the summit is broad and rounded and although variations occur along its length in terms of landform and landcover, it appears as a single landscape feature, forming a long and distinctive ridgeline of enclosure to the valleys to both west and east.

187. Landscape character varies with smaller, more enclosed fields on the undulating valley sides and larger, less enclosed fields across the ridge top. The landcover comprises mostly improved and semi-improved pasture, with occasional blocks of coniferous forestry. Settlement is widespread across the more sheltered valley sides, with the linear pattern of roads and built form following the contours. The elevated landform of the ridgeline makes it suitable for windfarm development and three commercial windfarms, comprising Long Mountain, Glenbuck I and II and Garves, occur as a cluster on the section of the ridge to the west of Dunloy to Glarryford.

188. A feature of this LCA is the distant views that can be gained across the adjacent valleys. These views are typically more open and less interrupted from the valley sides, whereas from the ridge top, the rounded profile of the landform combined with the intermittent occurrence of built form and vegetation can often reduce the influence of the wider landscape, including the association with the Antrim Hills to the east, where Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm are all located.

6.7.8.2 Sensitivity

189. The value of this LCA is medium. It is not covered by any national or regional landscape planning designations which would otherwise denote a recognised scenic value. While this LCA has been extensively modified by agricultural practices, the retention of a well-defined pattern of enclosure across the valley sides and the open character along the ridge top, add to the rural character and value.

190. The susceptibility of the LCA to the effects of the Development is moderated by its separation distance from the Antrim Hills where the Development would be located, as well as the existing influence of the operational windfarms in this LCA, which from an established part of its baseline character. The susceptibility is, however, raised by the fact that the ridges of the Long Mountain Hills and the Antrim Hills run in parallel, with the long sides facing each other over the valley of the River Main. There would be a stronger association form the valley side from the ridge top which is more distant and with less clear views owing to the rounded landform.

191. The combination of the value of the LCA and its susceptibility to the Development would give rise to an overall **medium** sensitivity rating.

6.7.9 Antrim Coast and Glens AONB

6.7.9.1 Baseline

192. The Antrim Coast and Glens AONB covers the north-east area of Northern Ireland from Ballycastle on the northern coast, to Larne on the eastern coast. The Antrim Coast and Glens was designated as an Area of Outstanding Natural Beauty (AONB) in 1988, under the Nature Conservation and Amenity Lands Order (Northern Ireland) 1985. It has been designated by the Northern Ireland Department of Environment to provide the area with formal statutory recognition as a landscape of national importance, and to formulate proposals for conserving its natural beauty, wildlife, historic objects and natural phenomena, promoting its enjoyment by the public and for providing or maintaining public access to it.

193. In the absence of a citation for the Antrim Coast and Glens AONB, which would describe the specific 'special qualities' and the reasons for the designation of the area, reference has been made to the Antrim Coast and Glens AONB Management Plan 2008 - 2018. This sets out the key features of the landscapes of the AONB, along with issues and challenges, current efforts and objectives for future improvements. Reference to existing and future windfarm developments is limited, with the following providing one of the few examples;

194. *'Skylines and summits are sensitive to change – electricity lines and pylons, telecommunications aerials and windfarms all would have a significant impact.'*

195. The AONB comprises the scenic combination of the upland plateau, enclosed glens and rugged coastline. The Antrim Plateau extends from the west to the centre of the AONB. It was into this upland area that a series of glens were formed through the action of the glaciers during the last ice age. These glens pass north-east and east towards the sea, where wide bays occur. Prominent headlands and cliffs line the coast between these bays and small islands occur offshore, the largest being inhabited Rathlin Island to the north. These landscape have been settled and cultivated for many centuries, with evidence of ancient earthworks and tombs, stone enclosures, churches and castles. In 2008, the AONB was home to 22,500 people, mostly located in settlements along the eastern coast, but also dispersed through the rural landscape. This is a worked landscape, used predominantly for improved pasture for livestock, as well as forestry and quarrying.

196. The Site lies beyond the western boundary of the AONB, adjacent to the northern section of the Antrim Plateau. This area is influenced by the uplands landscape with no influence from the glens or coast. While parts of the upland landscape have been retained as open moorland, commercial plantations of coniferous forestry are extensive, demonstrating the extent of human modification in this area. Settlement is sparse, with only a few isolated farmsteads and properties situated in the more sheltered valleys and associated with the farmland of semi-improved or rough grasslands.

6.7.9.2 Sensitivity

197. The value of the Antrim Coast and Glens AONB is high. The statutory AONB designation recognises the national scenic value of the landscapes which make up the AONB designation.

198. The susceptibility of the Antrim Coast and Glens AONB to the effects of the Development is medium. While there are no windfarm developments located in their entirety within the AONB there are a number along the western edge, including Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm, with the latter partially extending into the designated area. The presence of these windfarms establishes this type of development as a baseline influence on the character of the AONB and reduces the susceptibility to the addition of the Development in the wider context of the AONB. The presence of commercial forestry also reduces susceptibility by presenting a heavily modified landscape.

199. The combination of the value of the AONB and its susceptibility to the Development would give rise to an overall **medium to high** sensitivity rating.

6.7.10 Lissanoure Registered Garden

6.7.10.1 Baseline

200. Lissanoure House is located on Ballyveely Road approximately 1.5 km west of Loughuile. This site has been occupied since the 14th Century with a series of successive dwellings. The original Lissanoure Castle, set on Lough Guile, was rebuilt in 1770 as a Gothic Mansion, which was then destroyed by an explosion in 1874. Lissanoure Castle was the centre of a late 18th Century designed landscape, in which canals, lakes and islands were created, with bridges built to connect the land and boats used on the waterways. During this period, extensive tree planting was undertaken to create a parkland landscape and tree-lined paths, many of which still survive today. The hills around the designed landscape were planted up with mature shelter-belts, thus enclosing the extent of the views.

201. Following the explosion in 1874, The Cottage, a picturesque villa by J B Keane built in 1829, became the main house. This house sits in lawns, with a view of the lake and crannog. The stables remain intact and, along with the house, are now listed. The walled garden is currently not cultivated and has a restored glasshouse. Lissanoure House is private, although can be hired for weddings and other functions, and there is public access to Lough Guile. The demesnes form part of a large working estate which includes pastoral agriculture, forestry and turbary. A high stone wall encloses much of the boundary and of the three original gate lodges two remain; one of c.1830 by J B Keane and one at the south entrance of c.1860. Since 2000, more than 40,000 trees have been planted, including deciduous and coniferous whips and specimen trees and former walks have been re-established.

202. The Indicative Developable Area lies approximately 3.5 km to the south-east of Lissanoure Registered Garden. There is limited connection between the garden and much of the surrounding landscape owing to the extent and scale of the mature tree cover which covers substantial parts of the demesnes. Although the house sits within an open lawn, the enclosure of tree cover and landform limits the extent of visibility.

6.7.10.2 Sensitivity

203. The value of Lissanoure Registered Garden is high. This site has a rich history that has spanned more than seven centuries. The late 18th Century designed landscape presents a notable example of its time, parts of which have been well preserved and other parts which have been renovated or restored.

204. The susceptibility of Lissanoure Registered Garden to the effects of the Development is low. The garden has not been designed with any conscious connection or association with the surrounding landscape, which would otherwise heighten the susceptibility. Furthermore, the garden has been designed to create a landscape that is distinctly different from its agricultural context. The layout is introverted with shelterbelts established along the more elevated landform to screen the surrounding landscape and reinforce the enclosed nature of the garden.

205. The combination of the value of the RG and its susceptibility to the Development would give rise to an overall **medium** sensitivity rating.

6.7.11 Distance Bands

206. 'Wind Energy Development in Northern Ireland's Landscapes' (Northern Ireland Environment Agency, 2010) requires that the effects of the Development are described in relation to a series of defined distance bands: Immediate Landscape Setting (up to 2km), Local Landscape Setting (2-5km), Landscape Setting (5-15km), and Broad Landscape Context (15-30km). The Broad Landscape Context has been discounted from detailed assessment through the scoping process.

207. Through the scoping process it was agreed that only LCTs within the first 15 km radius of the Development would be considered and therefore the Broad Landscape Context has been discounted from the assessment. The three closer range distance bands are shown in conjunction with the LCAs in **Figure 6.8** and have been used as the basis upon which to structure the assessment of effects on landscape character. Four further LCAs within the 15 km radius have been discounted from the detailed assessment owing to the limited potential for a significant effect to arise, as described in **Section 6.5.3**.

208. The assessment of effects on the AONB and Historic Garden is carried out separately to that of the LCAs, in **Sections 6.8.14** and **6.8.15** of this Chapter, but also with reference to the distance bands.

209. The assessment of effects on landscape character refers to theoretical visibility of operational and under construction cumulative windfarms from the LCAs, AONB and Historic Garden. This theoretical visibility is shown on the individual cumulative ZTVs in **Figures 6.14** to **6.22**. These show theoretical visibility of each of the other windfarm sites in association with the Development.

6.7.12 Immediate Landscape Setting

210. The 2 km radius of the Immediate Landscape Setting of the Development is covered almost entirely by the Moyle Moorlands and Forests LCA and, therefore, only this LCA is considered in the assessment of effects on the Immediate Landscape Setting. The Site lies on the western margin of this LCA, as shown in **Figure 6.3** and in conjunction with the ZTV in **Figure 6.8**. Viewpoints 1, 3 and 6 lie within the Immediate Landscape Setting of the Moyle Moorlands and Forests LCA.

211. Operational Corkey Windfarm and Gruig Windfarm are located within the Immediate Landscape Setting and have a direct and indirect influence on the character of the LCA.

6.7.12.1 Sensitivity of the Immediate Landscape Setting

212. The sensitivity of the Moyle Moorlands and Forest LCA is assessed at **Section 6.7.5.2** as the combination of the medium to high value of the Moyle Moorlands and Forest LCA and its medium susceptibility to the Development, resulting in an overall **medium to high sensitivity.**

6.7.12.2 Magnitude of Change on the Immediate Landscape Setting

213. The Development lies within the Immediate Landscape Setting and changes to landscape character in this area would comprise both direct changes, whereby the elements and patterns of elements that constitute the landscape character would be altered, and indirect changes, whereby landscape character would be altered through visibility of the Development.

214. Within the Immediate Landscape Setting the magnitude of change on landscape character would vary according to the level and extent to which the Development would be visible. The ZTV in **Figure 6.8** shows that visibility would be almost continuous across the 2 km radius of the Immediate Landscape Setting. Small patches of no visibility would occur to the north-west of Slievenahanaghan Hill, where the intervening upland landform would screen visibility from the lower slopes. While visibility in the 2 km radius would mostly comprise all five turbines, to the south-east it would comprise fewer, where the intervening upland landform of Slievenahanaghan Hill, would reduce the levels of visibility from the lower slopes. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

215. The location of the Site at the centre of the Immediate Landscape Setting means that the initial decommissioning phase of works associated with Operational Corkey Windfarm and construction works would have direct, as well as indirect effects on landscape character. The most prominent features would be the tall cranes used in the decommissioning and construction phases, and the removal of the small turbines during the initial decommissioning phase and the erection of the large turbines during the construction phase. While there is a baseline influence from windfarm development within this 2 km radius

currently, the presence and activity associated with the cranes and turbines, as well as the construction of the associated infrastructure, including access tracks, crane pads, construction compound and control buildings, would give rise to a **medium to high** magnitude of change.

216. During the operational stage, the effects would relate principally to the presence and movement of the Development turbines. The following factors would add to the magnitude of change on the Moyle Moorland Forest LCA which makes up the Immediate Landscape Setting during the operational stage;

- On the Site itself, the presence of the turbines and new infrastructure associated with the Development;
- The larger scale of the Development turbines compared to the Operational Corkey Windfarm turbines would have an increased influence on the character of the LCA, owing to their increased vertical extent in contrast with the largely horizontal nature of the LCA;
- The larger scale of the Development turbines would be emphasised through comparison with the scale of the surrounding landform and features, with the turbines appearing to diminish the scale of Slievenahanaghan Hill;
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines and the variance would add to the prominence of the Development turbines; in the context of a baseline that already experiences scale comparisons between varying wind turbine sizes; and
- The Development turbines would become the defining feature within the 2 km radius of the Immediate Landscape Setting.

217. The following factors would moderate the magnitude of change on the Moyle Moorland Forest LCA which makes up the Immediate Landscape Setting;

- On the Site itself, the existing extent to which the landscape character has been modified by Operational Corkey Windfarm would moderate the change that would arise as a result of the Development;
- On the Site itself, the Development would be replacing an existing influence, rather than introducing a new influence on landscape character and this would moderate the magnitude of the change;
- The reduction in the number of turbines from ten to five would reduce the density and simplify the appearance of the Development; and
- The presence of Gruig Windfarm further emphasises the baseline influence of windfarm development in this LCA, which in turn moderates the additional effect of the Development.

218. Within the Immediate Landscape Setting the magnitude of change would be medium to high as a result of the operational stage of the Development. This finding relates chiefly to the location of the Development within this area and its close range influence across the 2 km radius. The magnitude of change is prevented from being rated high owing to the baseline influence of Operational Corkey Windfarm and Gruig Windfarm in the Immediate Landscape Setting which establish this type of development as part of the baseline character.

6.7.12.3 Significance of the Effect on the Immediate Landscape Setting – Moyle Moorlands and Forests LCA

219. The effect of the Development on the area of Moyle Moorlands and Forests LCA that is covered by the Immediate Landscape Setting would be **significant** during the initial decommissioning / contraction and operational phases, due to a combination of the medium to high magnitude of change and the medium to high sensitivity of the LCA that covers this area. The majority of this area, which is described above as having no or very limited visibility would have a **not significant** effect due to the low or negligible magnitude of change, despite the medium to high sensitivity of the LCA.

6.7.13 Local Landscape Setting

220. The 2 to 5 km radius of the Local Landscape Setting of the Development is covered by three LCAs; Moyle Moorlands and Forests LCA, Cullybackey and Clogh Mills Drumlins LCA and Central Ballymena Glens LCA. These three LCAs are all considered in the assessment of effects on the Local Landscape Setting.

221. Moyle Moorlands and Forests LCA lies within the Local Landscape Setting to the north, east and south-east of the Site as represented by Viewpoints 4, 5, 6 and 12. Cullybackey and Clogh Mills Drumlins LCA covers the Local Landscape Setting to the west of the Site as represented by Viewpoints 2, 4 and 11. Central Ballymena Glens LCA covers the Local Landscape Setting to the south of the Site.

222. Altaveedan Windfarm is the only operational, commercial-scale windfarm in the Local Landscape Setting, set in the Moyle Moorlands and Forests LCA to the north. While there are no operational commercial-scale windfarms within the Cullybackey and Clogh Mills Drumlins LCA, there are many operational domestic turbines dispersed across the rural landscape. Operational Corkey Windfarm and Gruig Windfarm are located in the Moyle Moorlands and Forests LCA in the adjacent Immediate Landscape Setting, such that these developments have an influence on the character of the Local Landscape Setting, albeit an indirect influence.

6.7.13.1 Sensitivity of the Local Landscape Setting

223. The sensitivity of the Local Landscape Setting is determined through a combination of the value attached to each of the LCAs and their susceptibility to the change brought about by the Development, as described in **Sections 6.7.5** to **6.7.7**. The sensitivity of the Moyle Moorlands and Forests LCA is medium to high, while the sensitivity of the Cullybackey and Clogh Mills Drumlins LCA and Central Ballymena Glens LCA is medium.

6.7.13.2 Magnitude of Change on the Local Landscape Setting – Moyle Moorlands and Forest LCA

224. The Development lies beyond the 2 to 5 km radius of the Local Landscape Setting, therefore, the change to landscape character in this area would be indirect or perceived; whereby the character of the landscape would be altered through visibility of the Development rather than through direct physical change.

225. Within the Local Landscape Setting the magnitude of change on landscape character would vary according to the level of visibility of the Development. The ZTV in **Figure 6.8** shows that theoretical visibility would be almost continuous within the 2 to 5 km radius with a patch of no visibility occurring to the south-east of the LCA in the lee of Skerry Hill, and along the north-east edge of the 5 km radius where the Slieveanorra ridgeline occurs. Smaller patches of no visibility would also occur to the south of Slieverush, and south-west of Gruig Hill. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

226. Theoretical visibility is shown to extend through the valley of the Bush River to the north, which is relatively open, and across the hill slopes of Slieveanorra to the north-east and east, which are mostly enclosed by coniferous forestry. The ridge through the open top of Slieveanorra and the adjacent summits marks the extent of visibility, with visibility becoming very limited from the north-east facing slopes on the opposite side of the ridge. A larger patch of no visibility occurs in the south-east of the 2 to 5 km radius where the upland landform screens visibility from the valley sides which are facing away from the Development. Actual visibility would be notably reduced by the extent of coniferous forestry across much of this LCA, including across the hill slopes from the north-east to the east. Where visibility would occur, it would comprise all five turbines apart from to the south and more marginally to the east.

227. The effect of the Development during the decommissioning, construction and operational phases would vary across the LCA depending on the level, extent and nature of visibility.

228. From the valley of the Bush River to the north, the magnitude of change would be **medium to high** around the 2 km radius, reducing to **medium** around the 5 km radius, during the initial decommissioning and construction phases. While much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and the construction of the Development would be screened by Slievenahanaghan Hill, the tall cranes and the decommissioning and construction of turbines would be readily visible, owing to their location on this prominent hilltop which encloses the southern end of the valley landscape. During the operational stage, the effects would relate principally to the presence and movement of the Development turbines. Despite the baseline influence of Operational Corkey Windfarm to the south and closer range Altaveedan Windfarm to the immediate east, the larger scale of the Development turbines and their association with the enclosing ridgeline of Slievenahanaghan Hill would increase their influence on the character of this valley landscape, especially from the closer range parts of the 2 to 5 km radius.

229. Across the hill slopes of Slieveanorra to the east and north-east there would be no effect during the combined decommissioning / construction stage, owing to the broad extent of coniferous forestry which would preclude visibility. From the more open ridgeline of Slieveanorra and the hilltop and hill slopes of Slievenanee, the magnitude of change would be **medium** during the combined initial decommissioning and construction phases. Despite the separation distance of 4 to 5 km, the extent to which these hills have been modified by commercial forestry and the baseline influence from Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm, the presence and activity of the tall cranes and the removal and addition of the turbines would form a notable feature, largely owing to their association with the prominent ridgeline of Slievenahanaghan Hill.

230. To the south-east of the Site the magnitude of change during the combined decommissioning / construction stage would be **medium** around the 2 km radius reducing to **medium to low** towards the southern boundary of the LCA. Intervening landform would reduce the extent of visibility across this area, such that all features of the decommissioning and construction would be screened apart from the tops of the cranes and turbines. While there would be no visibility from the area to the south-east of Skerry Hill, to the west of this typically five of the turbines would be visible and seen typically in conjunction with operational Gruig Windfarm to the fore.

231. During the operational stage, while the magnitude of change would be reduced by the complete appearance of the windfarm and the absence of the tall cranes, the proximity of these areas to the operational Development turbines would mean that the magnitude of change ratings set out above in relation to the decommissioning / construction stage would also apply to the operational stage. From the valley of the Bush River to the north, the magnitude of change would be **medium to high** around the 2 km radius, reducing to **medium** around the 5 km radius. Despite the baseline presence of Operational Corkey Windfarm, the larger scale of the Development turbines would mean that they would form a prominent and relatively close range feature set along the enclosing ridgeline to this valley landscape. Similarly from the hill slopes of Slieveanorra, during the operational stage, the vertical extent of the larger turbines, accentuated by the relatively small scale of the hill and the smaller scale of the adjacent Gruig Windfarm turbines, would give rise to a **medium** magnitude of change. To the south-east, the magnitude of change would reduce from medium around the 2 km radius to medium to low towards the southern boundary of the LCA. This lower rating would relate to the extent of intervening upland landform reducing the extent of the visual influence of the Development as well as the reductive effect of closer range Gruig Windfarm in terms of scale comparison.

232. Where no visibility occurs owing to the screening effect of intervening landform or the blanket cover of coniferous forestry, there would be no effect, although it must be noted that if the forestry were to be removed, visibility would open up and an effect would arise. Coniferous forestry is the predominant land cover in the area of the Moyle Moorlands and Forests LCA which falls within the Local Landscape Setting to the east and north-east of the Site.

6.7.13.3 Significance of Effect on the Local Landscape Setting – Moyle Moorlands and Forests LCA

233. A **significant** effect would occur across the following parts of the Moyle Moorlands and Forests LCA within the Local Landscape Setting; namely across the Bush River to the north, across the Slieveanorra ridge to the north-east and across Slievenanee and Slieverush to the south-east. These effects would arise in relation to the close association between these parts of the LCA and Slievenahanaghan Hill, upon which the Development would be located, and their relatively close range at distances between 2 and 5 km which would mean the larger turbines would be evident. A **not significant** effect would, however, occur across the majority of this LCA, owing to the enclosure from commercial forestry and therefore would not be subject to the influence of the Development.

6.7.13.4 Magnitude of Change on the Local Landscape Setting – Cullybackey and Clogh Mills Drumlins LCA

234. Where actual visibility occurs within the Local Landscape Setting, the magnitude of change would be medium to high, medium, or medium to low as a result of the Development. The ZTV in **Figure 6.8** shows that theoretical visibility would occur almost continuously across the area of the Cullybackey and Clogh Mills Drumlins LCA where it falls within the Local Landscape Setting, with the exception of a small patch of no visibility in the south-east. While actual visibility would be reduced by the screening effect of tree cover, hedgerows, localised landform and built form, the Development would still have an influence across most of this LCA owing to its location on the enclosing ridgeline to the east of the valley. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

235. During the combined initial decommissioning / construction phases, the magnitude of change would be **medium to high** to the immediate west of the Site, where there is a direct association with the west facing hill slopes and ridgeline of Slievenahanaghan Hill. While the associated buildings, construction compound and access tracks would only have an influence on localised and close range parts of this LCA, the effects of the tall cranes, and the decommissioning and construction of turbines would be more notable. Despite the baseline influence from Operational Corkey Windfarm and Gruig Windfarm and the extent to which this LCA has been modified through rural settlement and cultivation, the decommissioning and construction phases would be at variance with the character of this LCA, owing to the large scale change and activity taking place. The magnitude of change would reduce to **medium** between approximately 3 km and 5 km, as the separation distance would increase and the scale of the Development would decrease, and as the wider valley landscape would provide a greater influence on the character and greater occurrence of screening from landform and vegetation would occur.

236. During the operational stage, the larger scale of the completed Development turbines, compared to the Operational Corkey Windfarm turbines they would replace, would increase their influence on the character of the LCA in this area to the west of the Site. The large scale of the Development turbines would be accentuated through comparison with the smaller scale of the Gruig Windfarm turbines and the relatively small scale of Slievenahanaghan Hill. Furthermore, the proximity of the Development to Gruig Windfarm would give the impression that these two windfarms were one development, albeit with a variance in scale. However, during the operational stage, once the activity associated with the decommissioning and construction and the incomplete appearance of the turbines had gone, the magnitude of change would be **medium** from the 2 km radius reducing to **medium to low** out towards the 5 km radius of the Local Landscape Setting. The greater separation distance from the Development, combined with the wider influence from the surrounding valley landscape, would moderate the influence that the Development would have on the local landscape character and there would be patches where a lesser effect or no effect would occur, especially where intervening landform or vegetation would reduce the visual influence.

6.7.13.5 Significance of Effect on the Local Landscape Setting – Cullybackey and Clogh Mills Drumlins LCA

237. A **significant effect** would occur across the Cullybackey and Clogh Mills Drumlins LCA within the Local Landscape Setting during the combined initial decommissioning and construction phases. There would also be a **significant** effect during the operational stage and while this would extend to a 5 km radius to the west, it would reduce to **not significant** across the area to the north-west, where the association between the landscapes would weaken. The significant effects would arise in relation to the close association between the western parts of the LCA and Slievenahanaghan Hill, upon which the Development would be located, and their relatively close range at distances between 2 and 5 km which would mean the larger turbines would be evident.

6.7.13.6 Magnitude of Change on the Local Landscape Setting – Central Ballymena Glens LCA

238. This LCA sits to the south of the LCA and only the northern part falls within the 2 to 5 km of the Local Landscape Setting, the remainder of the LCA to the south being covered by the 5 to 15 km of the Landscape Setting. The ZTV in **Figure 6.8** shows that theoretical visibility would occur across the western half of the northern part of the LCA but not the eastern half, with the exception of a patch on the ridge to the south of Skerry Hill (459 m AOD). Operational Gruig Windfarm sits to the immediate south of the Development, making it a closer range influence across much of the Central Ballymena Glens LCA, albeit less prominent owing to the notably shorter turbines and location on the downslope rather than the ridgeline. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

239. The north-west to south-east alignment of Slievenahanaghan Hill, means that the Development has a closer association with the Cullybackey and Clogh Mills Drumlins LCA to the west, than the Central Ballymena Glens LCA to the south. The extent of intervening uplands between the Development and the Central Ballymena Glens LCA, comprising Gruig Hill and Slieverush, accentuates the separation distance and screens visibility from most of the north-eastern part of the LCA.

240. During the combined decommissioning and construction stage, the magnitude of change, where visibility would occur in the 2 to 5 km band of this LCA, would be **medium to high** around the 2 km radius reducing to **medium** around the 5 km radius. Despite the baseline influence of Operational Corkey Windfarm and Gruig Windfarm, the presence of the tall cranes and the activity associated with the initial decommissioning phase and construction of turbines would create an influence that would be at variance with the baseline character of this LCA. There would be no effect across those parts where visibility would not occur, which includes much of the north-eastern part of the LCA.

241. During the operational stage, despite the large scale of the turbines, the influence of the Development would be reduced by the complete nature of the turbines and the absence of construction activity. The magnitude of change would be **medium** on the 2 km radius reducing to **medium to low** on the 5 km radius. While the Development turbines would appear large in relation to the Operational Corkey Windfarm turbines they would replace, as well as the Gruig turbines, the closer range of the latter would reduce the variance in scale, even taking into account their lower elevation on the downslope. The intervening upland, although not extensive, would form some separation and partially screen the lower extents of the Development from much of the LCA.

242. The following factors would add to the magnitude of change on the Central Ballymena Glens LCA which makes up the Local Landscape Setting;

- The larger scale of the Development turbines, compared to the Operational Corkey Windfarm turbines they would replace, means they would have a greater influence on the character of the LCA, owing to their increased vertical extent in contrast to the lower-lying nature of the LCA;
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of the intervening hills and the glens of the LCA, with the turbines appearing to reduce the perceived scale of the landform;
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines, and the variance would add to the prominence of the Development turbines;
- The proximity of the Development to Gruig Windfarm would give the impression that these two windfarms were one development, albeit with a substantial variance in scale.

243. The following factors would moderate the magnitude of change on the Central Ballymena Glens LCA which makes up the Local Landscape Setting;

- The presence of the intervening uplands which would reduce the extent to which the Development would be visible from this LCA and which would add to the sense of separation where visibility does occur;
- The introverted character of the glens, owing to the enclosure of landform, tree cover and hedgerows, which further reduces the association with the uplands where the Development would be located;
- The influence of Operational Corkey Windfarm as an established feature associated with Slievenahanaghan Hill, which would mean the Development would be replacing an existing influence, rather than introducing a new influence on this LCA;
- The reduction in the number of turbines from ten to five would reduce the density and simplify the appearance of the Development from this LCA; and
- The proximity of the Development to Gruig Windfarm would ensure that the influence of windfarm development would be concentrated within a contained sector of the upland landscape.

6.7.13.7 Significance of Effect on the Local Landscape Setting – Central Ballymena Glens LCA

244. The potential effects on the Central Ballymena Glens LCA that lies within the 2 to 5 km band of the Local Landscape Setting would be moderated by the presence of intervening uplands which would reduce the extent to which the Development and associated decommissioning and construction works would be evident, as well as the presence of operational Gruig Windfarm, which would partly reduce the perceived variance in scale owing to its closer proximity. There would, however, be a **significant** effect during the combined decommissioning and construction out to a range of approximately 3 km as tall cranes and emerging turbines would have an influence. Once complete, the effect would become **not significant** during the operational stage.

6.7.13.8 Summary of the Significance of the Effect on the Local Landscape Setting

245. The overall effect on the Immediate Landscape Setting as a result of the Development would comprise both **significant** and **not significant** effects.

246. During the initial decommissioning, construction and operational phases, a **significant** effect would occur across the northern and south-eastern parts of the Moyle Moorlands and Forests LCA, as well as the open ridgeline through Slieveanorra, but not across the eastern part where the visual influence on landscape character would be limited by the blanket cover of coniferous forestry. A **significant** effect would also occur across the western part of the Cullybackey and Clogh Mills Drumlins LCA where the association with Slievenahanaghan Hill would increase the influence of the Development. This effect would extend out to approximately the 5 km radius. The effect to the north-west of the Cullybackey and Clogh Mills Drumlins LCA beyond 4 km would be **not significant** as the influence of the Development would be weaker in this area. The effect across the Central Ballymena Glens LCA would be **significant** during the combined decommissioning and construction stage out to approximately 3 km. During the operational stage the effect would be **not significant** owing to the limited association between this LCA and Slievenahanaghan Hill and the closer range influence from Gruig Windfarm.

6.7.14 Landscape Setting

247. The 5 to 15 km radius of the Landscape Setting of the Development is covered by ten LCAs, of which four are considered to have potential to undergo significant effects as a result of the Development. Three of these are those that also cover the Local Landscape Setting, namely, Moyle Moorlands and Forests LCA, Cullybackey and Clogh Mills Drumlins LCA and Central Ballymena Glens LCA, with the fourth one being Long Mountain Ridge LCA. The baseline characteristics of these LCAs are described in **Section 6.7.5** to **6.7.8** of this Chapter.

248. The Moyle Moorlands and Forests LCA covers the north-east sector of the 5 to 15 km radius of the Landscape Setting. The Cullybackey and Clogh Mills Drumlins LCA lies in the near west and Long Mountain LCA in the far west of the Landscape Setting, both landscapes positioned in parallel to follow the predominant north-west to south-east alignment. Central Ballymena Glens covers a more contained extent to the south. Viewpoints 8, 9, 13, 14, 16 and 17 lie within the Landscape Setting of Cullybackey and Clogh Mills Drumlins LCA; Viewpoint 7 lies within the Landscape Setting of the Moyle Moorlands and Forests LCA; and Viewpoints 10 and 18 lie within the Landscape Setting of the Long Mountain Ridge LCA.

249. The operational windfarms at Long Mountain, Glenbuck I and II, and Garves (**Figures 6.16, 6.17** and **6.18** respectively) are within the Landscape Setting of the Long Mountain Ridge LCA. The operational windfarms at Rathsherry and Elginny Hill (**Figures 6.19 and 6.20**) are within the Landscape Setting of the Central Ballymena Glens LCA. There are also a number of single and paired domestic turbines dispersed throughout the Cullybackey and Clogh Mills Drumlins LCA. There is potential for windfarms beyond the Landscape Setting to potentially affect its landscape character. The relevant schemes are Operational Corkey Windfarm and Gruig Windfarm which lie within the Immediate Landscape Setting of the Moyle Moorlands and Forests LCA and Altaveedan Windfarm, which lies within the Local Landscape Setting of the same LCA.

250. The Development lies beyond the 5 to 15 km of the Landscape Setting, therefore, the change to landscape character in this area would be indirect and perceived, whereby landscape character is altered through the visual influence of the Development as part of the wider context. Within the Landscape Setting the magnitude of change on landscape character will vary according to the level of visual influence of the Development, with distance as a key consideration, as its effect from a distance of 5 km will vary considerably from that at 15 km.

6.7.14.1 Sensitivity of the Landscape Setting

251. The sensitivity of the LCAs which make up the Landscape Setting is presented in **Section 6.7.5** to **6.7.8**. The sensitivity of Cullybackey and Clogh Mills Drumlins LCA, Central Ballymena Glens LCA and Long Mountain Ridge LCA is medium, while the sensitivity of the Moyle Moorlands and Forest LCA is medium to high.

6.7.14.2 Magnitude of Change on Landscape Setting – Moyle Moorlands and Forest LCA

252. The ZTV in **Figure 6.8** shows that theoretical visibility would be very limited in extent across the Landscape Setting of the Moyle Moorlands and Forests LCA, with the majority of the area having no visibility of the Development. The exceptions occur as patches of theoretical visibility to the north across Black Hill at approximately 5 km to 8 km and Knocklayd Hill at 13 km; to the north-east along eastern slopes of Glendun at approximately 8 km to 12 km and Crockaneel at approximately 13 km to 14 km; and to the east across the western slopes of Trostan at approximately 5 km to 7 km. The openness of most of these areas means the extent of actual visibility would reflect the extent of theoretical visibility, apart from along Glendun where tree cover would reduce actual visibility. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

253. During the combined initial decommissioning and construction phases, the magnitude of change would be **medium to low** or **low**. The presence and activity of the tall cranes, in combination with the decommissioning of the Operational Corkey Windfarm turbines and the construction of the Development turbines would be the main influence on the character of the LCA during this stage. While they would form readily visible features, set on the upland ridge of Slievenahanaghan Hill, the separation distance would reduce their influence, especially owing to the presence of other intervening upland hills and broad extents of commercial forestry. The effect would also be moderated by the baseline presence of Operational Corkey Windfarm in the same location and Gruig Windfarm to the immediate south. These windfarms would prevent the Development from occurring as a new influence.

254. During operation, where actual visibility occurs within the Landscape Setting of the Moyle Moorlands and Forests LCA, the magnitude of change as a result of the Development would be either **medium to low** or **low**. The magnitude of change is prevented from being rated high or medium to high, owing to the baseline influence of Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm in this LCA albeit in the Immediate Landscape Setting and Local landscape Setting.

255. The following factors would add to the magnitude of change on the part of the Moyle Moorland Forest LCA which makes up the Landscape Setting;

- The ridge comprising Slievenahanaghan Hill marks the western edge of the Antrim Hills and its local prominence would increase the visual influence of the Development, especially across the western slopes of Trostan Hill to the east;

- In those areas of open moorland where actual visibility would occur, the landscape would be more susceptible to the effects than where commercial forestry has had a greater modifying influence;
- The larger scale of the Development turbines compared to the Operational Corkey Windfarm turbines would have a greater influence on the character of the LCA, owing to their greater vertical extent in contrast to the largely horizontal nature of the LCA; and
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines and the variance would add to the prominence of the Development turbines.

256. The following factors would moderate the magnitude of change on the part of the Moyle Moorland Forest LCA which makes up the Landscape Setting;

- The very limited extent to which the Development would be visible across the Landscape Setting of this LCA;
- The extent of intervening uplands between the Development and Black Hill to the north would accentuate the separation distance, partially screen the lower extents of the Development, thus reducing the visual influence of the Development;
- The enclosing landform and tree cover of Glendun makes this an introverted landscape with its own immediate and well-defined visual influences, thus reducing the comparative visual influence from the Development in the more distant upland landscape;
- The extent of intervening uplands and commercial forestry between the Development and the western slopes of Trostan would accentuate the separation distance and reduce the visual influence of the Development;
- The baseline influence from the operational windfarms establishes this type of development as an existing influence on this LCA; and
- Generally, the separation distance of 5 to 15 km between the Development and these areas would reduce the influence that the larger scale Development turbines would have on the landscape character of this area.

6.7.14.3 Significance of Effect on Landscape Setting – Moyle Moorlands and Forests LCA

257. The effects of the Development on those parts of the Moyle Moorlands and Forests LCA that lies within the 5 to 15 km band of the Landscape Setting would be **not significant** during the initial decommissioning, construction and operational phases of the Development. This finding relates principally to the limited extent of visibility as shown on the ZTV on **Figure 6.8**, combined with the separation distance between the LCA and the Development and the baseline influence of windfarm development in the location of the Development.

6.7.14.4 Magnitude of Change on the Landscape Setting – Cullybackey and Clogh Mills Drumlins LCA

258. The ZTV in **Figure 6.8** shows that theoretical visibility would be almost continuous across the 5 to 15 km band of the Cullybackey and Clogh Mills Drumlins LCA, with the majority of the area having some theoretical visibility of the Development. Actual visibility would, however, be reduced by the extent of tree cover, hedgerows, localised landform and built-form in the area and this would reduce the influence of the Development on the landscape character. The ZTV also shows patches where no theoretical visibility would occur, the main areas occurring to the south of to the north-west of Cloughmills and to the north-west of Ballyknock Hill, with theoretical visibility becoming patchy across the north-western part of the LCA. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

259. During the combined initial decommissioning and construction phases, the magnitude of change would be **medium to low** or **low**. The presence and activity of the tall cranes, in combination with the decommissioning of the Operational Corkey Windfarm turbines and the construction of the Development turbines would be the main influence on the character of the LCA during this stage. While they would form readily visible features, set on the upland ridge of Slievenahanaghan Hill, the separation distance would reduce their influence, especially owing to the broad extent of the valley and the presence of tree cover and hedgerows which makes this landscape more enclosed and introverted. The effect would also be moderated by the baseline presence of Operational Corkey Windfarm in the same location and Gruig Windfarm to the immediate south. These windfarms would prevent the Development form occurring as a new influence.

260. During operation, where actual visibility occurs within the Landscape Setting of the Cullybackey and Clogh Mills Drumlins LCA, the magnitude of change as a result of the Development would be either **medium to low** or **low**. The magnitude of change is prevented from being rated high or medium to high, owing to the baseline influence of Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm in this LCA albeit in the Immediate Landscape Setting and Local landscape Setting.

261. The following factors would add to the magnitude of change on the Cullybackey and Clogh Mills Drumlins LCA within the Landscape Setting;

- The ridge comprising Slievenahanaghan Hill marks the eastern edge of the River Main valley and its local prominence would increase the visual influence of the Development, especially across the closer range areas within the 5 to 15 km Landscape Setting;
- While intervening landform, vegetation and built form would reduce actual visibility in some parts, the Development would nonetheless have a widespread visual influence across much of the LCA;
- The larger scale of the Development turbines compared to the Operational Corkey Windfarm turbines would have a greater influence on the character of the LCA, owing to their vertical nature in contrast to the largely horizontal nature of the LCA; and
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines and the variance would add to the prominence of the Development turbines.

262. The following factors would moderate the magnitude of change on the Cullybackey and Clogh Mills Drumlins LCA within the Landscape Setting;

- The separation distance of 5 to 15 km between the Development and these areas would reduce the influence that the larger scale Development turbines would have on the landscape character of this area.
- The effect of intervening landform, vegetation and built form which would not only reduce the extents of actual visibility but also reduce the extent to which the Development would b visible from certain areas;
- The influence of Operational Corkey Windfarm as an established feature associated with Slievenahanaghan Hill, which would mean the Development would be replacing an existing influence, rather than introducing a new influence on this LCA;
- The reduction in the number of turbines from ten to five would reduce the density and simplify the appearance of the Development from this LCA; and
- The proximity of the Development to Gruig Windfarm would ensure that the influence of windfarm development would be concentrated within a contained sector of the upland landscape.

6.7.14.5 Significance of Effect on Landscape Setting – Cullybackey and Clogh Mills Drumlins LCA

263. The effects of the Development on those parts of the Cullybackey and Clogh Mills Drumlins LCA that lies within the 5 to 15 km band of the Landscape Setting would be **not significant** during the initial decommissioning, construction and operational phases of the Development. This finding relates principally to the separation distance between the LCA, the occurrence of intervening landform and vegetation and the baseline influence of windfarm development in the location of the Development.

6.7.14.6 Magnitude of Change on the Landscape Setting – Central Ballymena Glens LCA

264. The ZTV in **Figure 6.8** shows that theoretical visibility would be intermittent across the 5 to 15 km band of the Landscape Setting of the Central Ballymena Glens LCA, with theoretical visibility generally concentrated more across the western side of the LCA and less across the eastern side. In the western part of the LCA, while theoretical visibility is shown to be broadly continuous, there are also patches of no visibility, owing to the undulating nature of the landform. In the eastern part of the LCA, a large area without visibility is created in the lee of the ridgeline between Skerry Hill and Slieverush. To the south of where the glens of Skerry Water, and Ballsallagh Water occur, a band of visibility stretches across the north-west facing slopes of Carncormick Hill, albeit at a distance of 7 to 9 km from the Development. While the ZTV shows that visibility is mostly of all five turbines, the extent of the intervening upland landscape would mean that the full vertical extent of the Development would seldom be visible. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

265. During the initial decommissioning and construction phases, the magnitude of change would be **medium to low** around the 5 km radius reducing to **low or negligible** around the 15 km radius. There would be **no effect** where there is no visibility of the Development. The presence and activity of the tall cranes, in combination with the decommissioning of the Operational Corkey Windfarm turbines and the construction of the Development turbines would be the main influence on the character of the LCA during this stage. Owing to the extent of intervening landform, the lower parts of the works would typically be screened such that it would mostly be the middle to upper parts of the cranes and turbines that would be visible only intermittently, and this would reduce the prominence of these features and their influence on landscape character. The effect would also be moderated by the baseline presence of Operational Corkey Windfarm in the same location and Gruig Windfarm to the immediate south. These windfarms would prevent the Development from occurring as a new influence.

266. During operation, where actual visibility occurs within the Landscape Setting of the Cullybackey and Clogh Mills Drumlins LCA, the magnitude of change as a result of the Development would be **medium to low** around the 5 km radius reducing to **low or negligible** around the 15 km radius. There would be **no effect** where there is no visibility of the Development. The magnitude of change is prevented from being rated high or medium, owing to the separation distance from the Development, the limited extent of visibility across the eastern part of the LCA and the baseline influence of Operational Corkey Windfarm and Gruig Windfarm on this LCA, as well as the closer range baseline influence of Rathsherry Windfarm and Elginny Hill Windfarm in the Landscape Setting of this LCA.

267. The following factors would add to the magnitude of change on the part of the Central Ballymena Glens LCA within the Landscape Setting;

- The larger scale of the Development turbines, compared to the Operational Corkey Windfarm turbines they would replace, means they would have a greater influence on the character of the LCA, owing to their increased vertical extent in contrast to the lower-lying nature of the LCA;
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of the intervening hills and the glens of the LCA, with the turbines appearing to reduce the perceived scale of the landform;
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines, and the variance would add to the prominence of the Development turbines;
- The proximity of the Development to Gruig Windfarm would give the impression that these two windfarms were one development, albeit with an apparent variance in scale and visible from only parts of the LCA.

268. The following factors would moderate the magnitude of change on the part of the Central Ballymena Glens LCA which makes up the Local Landscape Setting;

- The limited extent of actual visibility and the limited extent to which the Development would be visible in those areas where visibility would occur;
- The presence of the intervening uplands which would reduce the extent to which the Development would be visible from this LCA and which would add to the sense of separation where visibility does occur;
- The separation distance which would reduce the perceived scale of the Development and limit its influence in the context of the influence of the wider landscape;
- The introverted character of the glens, owing to the enclosure of landform, tree cover and hedgerows, which further reduces the association with the uplands where the Development would be located;
- The influence of Operational Corkey Windfarm as an established feature associated with Slievenahanaghan Hill, which would mean the Development would be replacing an existing influence, rather than introducing a new influence on this LCA;
- The variance in scale between the Gruig turbines and Development turbines would occur within a landscape where different sized turbines form an established part of the baseline character;
- The reduction in the number of turbines from ten to five would reduce the density and simplify the appearance of the Development from this LCA; and
- The proximity of the Development to Gruig Windfarm would ensure that the influence of windfarm development would be concentrated within a contained sector of the upland landscape.

6.7.14.7 Significance of Effect on Landscape Setting – Central Ballymena Glens LCA

269. The effects of the Development on those parts of the Central Ballymena Glens LCA that lies within the 5 to 15 km band of the Landscape Setting would be **not significant** during the initial decommissioning, construction and operational phases of the Development. This finding relates principally to the separation distance between the LCA and the Development, the weak association between the LCA and the Site of the Development and the baseline influence of windfarm development in the location of the Development.

6.7.14.8 Magnitude of Change on the Landscape Setting – Long Mountain Ridge LCA

270. The ZTV in **Figure 6.8** shows that theoretical visibility would be almost continuous across the 5 to 15 km band of the Landscape Setting of the Long Mountain Ridge LCA, with the majority of the area shown to have some theoretical visibility of the Development. Actual visibility would, however, be slightly reduced by the extent of tree cover, hedgerows, localised landform and built-form in the area. The ZTV also shows small patches where no theoretical visibility would occur, mostly along the 15 km radius of the Landscape Setting. The rounded summit forms a viewshed west of which, across the west facing slopes, there would be no theoretical visibility of the Development, although this lies beyond the Landscape Setting. The operational windfarms, Glenbuck I and II and Garves are all located on or just within the 15 km radius of the Landscape Setting, while Long Mountain lies just beyond. Collectively they form a cluster which has a close range influence on the character of this LCA. The comparative ZTV in **Figure 6.13** shows that the theoretical visibility of the Development would largely replicate the extent of theoretical visibility produced by Operational Corkey Windfarm.

271. During the initial decommissioning and construction phases, the magnitude of change would be **medium to low** or **low**. The presence and activity of the tall cranes, in combination with the decommissioning of the Operational Corkey Windfarm turbines and the construction of the Development turbines would form the only readily visible components during this stage. While they would form readily visible features, set on the upland ridge of Slievenahanaghan Hill, the separation distance would reduce their influence, especially owing to the broad extent of the intervening valley and the presence of tree cover and hedgerows which makes the valley slopes more enclosed and introverted. The effect would also be moderated by the baseline presence of Operational Corkey Windfarm in the same location and Gruig Windfarm to the immediate south. These windfarms would prevent the Development from occurring as a new influence across those parts of the LCA from which visibility of the Development would arise.

272. During operation, where actual visibility occurs within the Landscape Setting of the Long Mountains LCA, the magnitude of change as a result of the Development would be **medium to low** on the 5 km radius reducing to **low** or **negligible** on the 15 km radius. There would be **no effect** where there is no visibility of the Development. The magnitude of change is prevented from being rated high or medium, owing to the separation distance from the Development and the baseline influence of Operational Corkey Windfarm and Gruig Windfarm on this LCA, as well as the closer range baseline influence of Long Mountain, Glenbuck I and II and Garves in the Landscape Setting of this LCA.

273. The following factors would add to the magnitude of change on the Long Mountain LCA which makes up the Landscape Setting;

- The eastern flank of Long Mountain LCA is orientated across the valley of the River Main towards the western flank of the Antrim Hills and this association would increase the influence of the Development on the character of the LCA;
- Despite the screening effect of localised landform, vegetation and built form, the Development would be visible from much of this LCA, especially the eastern flank which is orientated towards the Antrim Hills;
- The ridge comprising Slievenahanaghan Hill forms a distinctive landform feature of local prominence and the location of the Development on this ridge would increase its influence;
- The larger scale of the Development turbines compared to the Operational Corkey Windfarm turbines would have a greater influence on the character of the LCA, owing to their vertical nature in contrast to the largely horizontal nature of the LCA; and
- The larger scale of the Development turbines would be emphasised through comparison with the smaller scale of operational Gruig Windfarm turbines and the variance would add to the prominence of the Development turbines.

274. The following factors would moderate the magnitude of change on the Long Mountain LCA which makes up the Landscape Setting;

- The separation distance of 7 to 15 km from between the Development and the LCA which would reduce the visual influence of the Development by making it a smaller scale feature within a wider landscape;
- The reduction in actual visibility owing to the screening effect of localised landform, vegetation and built form;
- The reduction in the association between the rounded hilltop of Long Mountain LCA and the Antrim Hills to the east of the valley of the River Main;
- The baseline influence from operational Long Mountain, Garves I and II and Glenbuck in this LCA, which as closer range examples of windfarms would reduce the comparative influence of the Development; and
- The reduction in the number of turbines from ten to five and the relatively compact and contained extent they occupy on Slievenahanaghan Hill.

6.7.14.9 Significance of Effect on Landscape Setting – Long Mountain Ridge

275. The effects of the Development on those parts of the Long Mountain Ridge LCA that lies within the 5 to 15 km band of the Landscape Setting would be **not significant** during the initial decommissioning, construction and operational phases of the Development. This finding relates principally to the separation distance between the LCA and the Development and the baseline influence of windfarm development in the location of the Development.

6.7.14.10 Summary of the Significance of the Effect on the Landscape Setting

276. The effect on those parts of the Moyle Moorlands and Forests LCA, Cullybackey and Clogh Mills Drumlins LCA, Central Ballymena Glens LCA and Long Mountain LCA which occur within the Landscape Setting of the Development would be **not significant** during the initial decommissioning, construction and operational phases of the Development. This finding relates principally to the greater separation distance between the Landscape Setting parts of these LCAs and the Development but also the baseline influence of operational windfarms both in these LCAs and in the LCA where the Development would be located.

6.7.15 Antrim Coast and Glens AONB

277. The Antrim Coast and Glens AONB covers the eastern part of the Immediate Landscape Setting (up to 2 km from the nearest turbine), the eastern part of the Local Landscape Setting (between 2 km and 5 km from the nearest turbine) and the eastern part of the Landscape Setting (between 5 km and 15 km from the nearest turbine). In the absence of a citation or a description of the 'special qualities' or key landscape characteristics of the AONB, the assessment of effects on the landscape character of the AONB is based on the LCAs that cover the AONB.

278. The LCAs covered by the AONB, which are of relevance to the assessment, include the Moyle Moorlands and Forests LCA (Immediate Landscape Setting, Local Landscape Setting and Landscape Setting) and the Central Ballymena Glens LCA (Local Landscape Setting and Landscape Setting). The assessment of effects on the LCAs within these three distance bands, as carried out in **Sections 6.7.12** to **6.7.14** of this Chapter, is therefore used as the basis for the assessment of effects on the landscape character of the AONB. This assessment is described in the magnitude of change on the AONB section below.

279. Operational Corkey Windfarm and Gruig Windfarm lie to the immediate west of the AONB Boundary, while Altaveedan Windfarm to the north lies partially within the AONB and windfarms at Rathsherry and Elginny Hill to the south also lie just outwith the boundary. There are also a number of consented single turbines, which lie close to the AONB boundary.

6.7.15.1 Sensitivity of the AONB

280. The sensitivity of the AONB is determined through a combination of the value attached to the LCAs in the designated area and their susceptibility to the development as these take into account the heightened value attributed to the AONB area. The sensitivity of the Antrim Coast and Glens AONB is medium to high.

6.7.15.2 Magnitude of Change and Significance of Effect

281. The magnitude of change on the AONB is assessed through reference to the various distance bands, with their constituent LCAs, that cover the AONB as is required by the SPG[36]. These are assessed in detail in **Sections 6.7.12** to **6.7.14** and are summarised below.

282. The ZTV in **Figure 6.8** shows the limited extent to which the Development would be visible across the AONB with a patch concentrated to the immediate west of the Development and then only smaller and more distant patches dispersed across the elevated hill slopes that face towards the Development. The vast majority of the AONB would remain unaffected by the Development. Furthermore, and as the cumulative ZTVs in **Figures 6.14** to **6.22** show, visibility of the Development would largely occur in those areas where visibility of operational windfarms already occurs.

6.7.15.3 Immediate Landscape Setting of the AONB

283. During the initial decommissioning, construction and operational phases, the magnitude of change within the Immediate Landscape Setting of the Moyles Moorland and Forest LCA would be **medium to high** and the effect would be **significant**.

6.7.15.4 Local Landscape Setting

284. During the initial decommissioning, construction and operational phases, the magnitude of change within the Local Landscape Setting of the Moyles Moorland and Forest LCA would range from **medium to high,** to **medium to low**, with some areas experiencing **no effect**. The open valley landscape of the Bush River to the north of the Development and the open hill slopes of Slievenanee to the south-east would undergo a **medium to high** magnitude of change around the 2 km radius, which would gradually decrease to **medium** on the edge of the 5 km radius. Much of the area to the east is enclosed by commercial forestry and, here, there would be **no effect**. Along the open ridgeline of Slieveanorra to the north-east, the magnitude of change would be **medium**. In all the areas where there would be a medium or medium to high magnitude of change, the effect would be **significant**. Much of the area to the east is enclosed by commercial forestry and, here, there would be **no effect** during initial decommissioning, construction and operation.

285. During the initial decommissioning, construction and operational phases, the magnitude of change within the Local Landscape Setting of the Central Ballymena Glens LCA would range from **medium to high,** to **medium to low**, with some areas experiencing **no effect**. There would be a **significant** effect during the initial decommissioning and construction phases within the 2 to 3.5 km radius where a **medium** magnitude of change would occur and there would be a **not significant** effect across the remainder of the LCA. There would be no significant effects during the operational stage, largely owing to the closer range influence of Gruig Windfarm.

6.7.15.5 Landscape Setting

The effects of the Development on the Landscape Setting of the AONB would be **not significant**. The assessment of the constituent LCAs in this band showed that the magnitude of change during the initial decommissioning, construction and operational phases would be either **medium to low**, **low**, **negligible** or **no effect**, largely owing to the reduced extents of visibility combined with the increasing separation distances and the baseline windfarm influences.

6.7.16 Lissanoure Historic Garden

286. A baseline description of Lissanoure Historic Garden is presented in **Section 6.7.10**, along with an assessment of its sensitivity to the Development. The combination of the high value and low susceptibility gives rise to a medium sensitivity. This finding relates chiefly to the extent of enclosure within and around the designated area.

6.7.16.1 Magnitude of Change and Significance of Effect

287. The magnitude of change on Lissanoure Registered Garden would be **low**. Despite the extent of theoretical visibility across Lissanoure demesnes, as shown on the ZTV in **Figure 6.9**, and the relatively close proximity of the Development to the garden, the density, scale and extent of mature tree cover within the garden and in the surrounding landscape would restrict visibility of the Development during the combined decommissioning and construction phases, as well as the operational stage. This means that the Development would have a very limited influence on the character of the Historic Garden and the effect would be **not significant** during the initial decommissioning / construction and operational phases.

6.7.17 Summary of Effects on Landscape Character

288. The assessment of effects on landscape character has identified that significant effects would arise as a result of the Development across the full extent of the Immediate Landscape Setting (0 to 2 km) and across parts of the Local Landscape Setting (2 to 5 km) but with no effects across the Landscape Setting (5 to 15 km). Those parts of the LCAs that would undergo significant effects are as follows:

- The Moyles Moorlands and Forests LCA, across the whole of the Immediate Landscape Setting, and across the northern and south-eastern parts of the Local Landscape Setting, as well as the outer edge of this area to the north-east during initial decommissioning, construction and operation.
- Cullybackey and Clogh Mills Drumlins LCA, across the whole of the Local Landscape Setting during the initial decommissioning, construction and operation, with the exception of the north-west part which would only undergo significant effects during the combined decommissioning and construction.
- The Central Ballymena Glens LCA, out to a range of approximately 3 km during the combined decommissioning and construction phases.

289. The significant effects across the AONB would coincide with those significant effects identified in relation to the Moyles Moorlands and Forests LCA and Central Ballymena Glens LCA which are covered by the AONB. The effect on Lissanoure Historic Garden would be **not significant** owing to the extent of enclosure around this designed landscape.

6.8 Effects on Visual Amenity

290. Effects on visual amenity are the changes to views experienced by people that result from the introduction of the Development as a replacement to Operational Corkey Windfarm. The assessment of effects on views includes effects on the 18 viewpoints

[36] Northern Ireland Environment Agency's (NIEA) Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18 Renewable Energy.

which illustrate visibility of the Development from points within the Study Area, and effects on the principal visual receptors such as settlements and routes that are partially represented by these viewpoints.

291. The viewpoint locations are shown in conjunction with the blade tip ZTV on **Figures 6.6a** (30 km radius) and **6.6b** (15 km radius) and the hub height ZTV on **Figures 6.7a** (30 km radius) and **6.7b** (15 km radius). The viewpoints are illustrated in wirelines and photomontages in **Figures 6.23 to 6.40**. Visualisations have been prepared to the standards of SNH 2017 guidance, as agreed through the scoping process.

292. In the wirelines, the Development turbines are shown in red, operational and under-construction windfarms are indicated in black, consented windfarms in green and application-stage windfarms in blue (as defined in **Table 6.6**). Operational Corkey Windfarm is shown in the baseline photographs.

293. **Section 6.5**: Baseline Description identifies the viewpoints and principal visual receptors that have the potential to undergo significant effects and significant cumulative effects and, therefore, require further assessment. The effect on each of these viewpoints and principal visual receptors is assessed below. The other principal visual receptors were found through the scoping process and subsequent preliminary studies, to not have the potential to undergo a significant effect and have therefore not been assessed in any further detail.

294. The viewpoints and associated principal visual receptors that are assessed in more detail are as follows:

- Viewpoint 1: Corkey
- Viewpoint 2: Lislaban
- Viewpoint 3: Reservoir Road
- Viewpoint 4: Loughgiel
- Viewpoint 5: Altnahinch Road south
- Viewpoint 6: Altnahinch Reservoir
- Viewpoint 7: Slieveanorra
- Viewpoint 8: Ballycregagh Road, Clough Mills
- Viewpoint 9: B94 over A26 west of Clough Mills
- Viewpoint 10: Tullaghans Road, Dunloy
- Viewpoint 11: Ballyweeny, Ballyveely Road
- Viewpoint 12: Altnahinch Road north
- Viewpoint 13: Cemetery near Glarryford
- Viewpoint 14: Kilmandil Road
- Viewpoint 15: Slemish
- Viewpoint 16: A26 Clough Junction
- Viewpoint 17: A26 south-east of Ballymoney
- Viewpoint 18: Boghill, Long Mountain

6.8.1 Viewpoint 1: Corkey

6.8.1.1 Baseline

295. The viewpoint is located on Corkey Road, to the immediate west of the junction with Carnamenaugh Road, and to the east of the Corkey village boundary. Corkey Road is the minor road linking Loughgiel in the north with Moneyduff Road in the south. Corkey is a small village set on the western side of Slievenahanaghan Hill. The viewpoint is representative of the views of road-users on Corkey Road and residents in Corkey Village.

296. Corkey village lies in the transition between the settled and cultivated lowland valley of the River Main and the less settled and cultivated uplands of the Antrim Hills. The landform rises up to the east of Corkey Road and Corkey Village to form the open and rounded Slievenahanaghan Hill (circa 400m AOD). Land-uses change within this transition from small fields of predominantly improved pasture, to semi-improved and rough grasslands within a larger field pattern. Traditional stone walls and hedgerows provide enclosure in the lowlands, while the more prevalent post and wire boundaries add to the openness of the upland landscape. Tree cover generally becomes sparser towards the upland moorland of Slievenahanaghan Hill, while across the hills further east, blocks of coniferous plantation establish a more modified character.

297. The village of Corkey comprises a small number of streets of residential development, and a primary school and playing fields located on the junction between Corkey Road and Reservoir Road. The orientation of the properties generally follows the orientation of the landform, such that they mostly face westwards across the valley and back eastwards onto the rising hillside. Other properties face north to south as they follow streets rising up the hillside. Views are generally open and extend up the hillside to where Operational Corkey Windfarm is positioned on the hilltop. While these ten turbines have a presence, their relatively small scale reduces their prominence in the views of road-users and residents, such that their influence is limited. Gruig Windfarm is also visible to the south of Operational Corkey Windfarm, albeit less prominent owing to its location below Slievenahanaghan Hill.

6.8.1.2 Sensitivity

298. The value of the views from Corkey and Corkey Road is medium. The viewpoint and the view are not covered by any national or regional landscape designations which would otherwise attribute a special recognised value to the surrounding landscape. There are also no formal viewpoints on Corkey Road or in the village which would otherwise attribute a special and recognised scenic value to the viewpoint and view. There is, however, a local value associated with the visual amenity, especially of residents but also road-users, and this raises the rating to medium.

299. The susceptibility of road-users on the Corkey Road would be high. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from much of Corkey Road, apart from where landform cutting, vegetation and built development screen views within localised sections. Although the view to the Development would occur at an oblique angle to the direction of road-users, the minor status of this road and the moderate speed of vehicles, as they slow on approach towards the edge of the village where a 30mph restriction applies, means road-users may potentially have a greater awareness of their surroundings. Operational Corkey Windfarm is readily visible from those sections of the road not enclosed by roadside vegetation.

300. The susceptibility of residents in Corkey would be medium to high. The Development would be located within close range on the hilltop to the east of the village. While this gives rise to a high susceptibility, the following factors moderate this rating. Firstly, few properties have their principal orientation eastwards up the hillside, with most facing westwards across the valley or north or south. Secondly, the rising landform occupies much of the views from the east side of the properties, such that the Development would either not be seen from internal living spaces or be seen on top of this landform. Thirdly, operational windfarms are a baseline feature in views of Slievenahanaghan Hill from Corkey and this reduces the susceptibility of road-users and residents.

301. The combination of the value and the susceptibility would give rise to an overall **medium to high** sensitivity for residents and road-users.

6.8.1.3 Magnitude of Change

302. The wireline in **Figure 6.23** shows that all five Development turbines would be theoretically visible set on, or behind, the ridgeline of Slievenahanaghan Hill. The closest Development turbine would be seen at a distance of 1.68 km, with the other two turbines on the ridge seen, at a similar range and the two turbines behind the ridge seen at a slightly longer range. They would be seen to the left of operational Gruig Windfarm, which occupies the downslope of Gruig Hill and is partially screened by the intervening landform.

303. The proximity of the Site to Corkey Road and Corkey village means that much of the decommissioning works associated with Operational Corkey Windfarm and the construction works would be readily visible. The most prominent features would be the tall cranes used to dismantle and erect the turbines. The cranes and the turbines would be of a similar height and these features would appear at variance with the scale of Slievenahanaghan Hill and the magnitude of change during the combined decommissioning and construction stage would be **high**. The general activity and disruption of the overall works programme would last longer than the presence of the cranes and would include earthworks to make up the levels and the construction of transformers at the base of each turbine. The design of the infrastructure has used the rounded profile of Slievenahanaghan Hill, to ensure that most of the tracks would be screened by the brow of the hill. The existing Operational Corkey Windfarm access track leading up the right side, would be reused, and while this would require some widening the visual effect would be limited. The location of the construction compound and control station to the north of Moneyneagh has been carefully considered to ensure that these features would lie in the fold between the lower and upper slopes and mostly be screened by intervening landform from much of the settlement and road. The permanent meteorological mast would form an additional feature along the skyline ridge, albeit smaller in scale and less apparent owing to the lattice pattern, rather solid structure.

304. During the operational stage, the effects would relate principally to the presence and movement of the Development turbines. The following factors would add to the magnitude of change on the views of residents and road-users in the Corkey area during this phase;

- The close proximity of the Development to residents and road-users would mean that the Development turbines would appear as large scale moving structures on this prominent local hill top;
- The Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which have been removed. No direct scale comparison would be possible as the 57 m tall Wind Turbines would be removed prior to the 137 m Wind Turbines being erected. Any perceived increase would be based on people's recollection of the difference in the comparative scale of these Wind Turbines and the features of the landscape in the views;
- Where the Development would be seen in combination with operational Gruig windfarm, the variance in scale would accentuate the larger scale of the Development turbines in the context of a baseline which already contains scale comparisons;
- Because Slievenahanaghan Hill is not seen to its full height, the comparative scale of the Development turbines would reduce the perceived scale of the hill; and
- Although residents may not gain clear views from their internal living space, the Development would be likely to be visible from most garden grounds and approaches.

305. The following factors would moderate the magnitude of change on the views of residents and road-users in the Corkey area;

- The baseline visibility of Operational Corkey Windfarm would mean that the Development would be visible in views which for more than 24 years have been characterised by the presence of a windfarm in this same location;
- The reduction in the number of turbines from ten to five, would mean the Development would have a simpler appearance that would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view;
- The turbines would appear evenly spaced and form a tidy composition that appears legible in this upland landscape;
- The small separation gap between the Development and Gruig Windfarm, and the variance in vertical scale would ensure that they would appear as separate developments, preventing the appearance of one larger development;
- While the Development would have a notable effect on the views of residents and road-users, the influence of Gruig Windfarm is moderated by its less prominent location offset from the ridgeline of Slievenahanaghan Hill and the smaller scale of the turbines and this would reduce the combined effect.

306. Taking all these factors into account, the magnitude of change on the views of residents and road-users as a result of the operational phase of the Development would be **medium to high**.

6.8.1.4 Significance of Effect

307. The effect of the Development on residents and road-users would be **significant** during both the decommissioning / construction, and operational phases. This finding relates chiefly to the proximity of Corkey Road and Corkey village to the Development, and the increased influence that the larger turbines would have on the character of the views, despite there being a current influence from the Operational Corkey Windfarm and Gruig Windfarm.

6.8.2 Viewpoint 2: Lislaban

6.8.2.1 Baseline

308. This viewpoint is located at the crossroads between Lislaban Road and Loughill Road, approximately 3.57 km to the south-west of the closest turbine. It is representative of road-users on these quiet, minor roads, as well as residents in the surrounding dispersed properties, many of which are rural farmsteads. The viewpoint is located in the valley of the River Main, with the landform to the east rising to the local landmark features of Gruig Hill and Slievenahanaghan Hill.

309. Agriculture is the major land use in this area and the landscape is characterised by small to medium fields of predominantly improved pasture and occasionally arable crops. Enclosure is limited to fragmented hedgerows set along post and wire fence boundaries. While tree belts are more evident to the south and west, tree cover is sparse as the landform gradually rises to the east. The extensive presence of agricultural land uses denotes the modified nature of this valley landscape, and while many of the properties are typically small scale and rural, many of the farmsteads comprise a complex of large sheds and silos, and this presents a more developed character.

310. The hills to the east present a contrast in character with the darker land cover indicating the unimproved and rougher nature of the grasslands inherent to the upland landscape. The ridgeline between Gruig Hill and Slievenahanaghan Hill forms a prominent feature, enclosing the valley landscape and containing the eastward extent of views. All ten of the Operational Corkey Windfarm turbines are visible along this ridgeline, while Gruig Windfarm, to the immediate right, is completely screened by intervening landform. Single domestic wind turbines occur at either end of this hill ridge, their scale appearing comparable to the scale of the Operational Corkey Windfarm turbines.

6.8.2.2 Sensitivity

311. The value of the views from Lislaban is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints in this rural area; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

312. The susceptibility of road-users on Lislaban Road would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from much of Lislaban Road, apart from where landform cutting, vegetation and built development screen views within localised sections. Although the view to the Development would occur at an oblique angle to the direction of road-users, the minor status of this road and the moderate speeds of vehicles, as they approach or leave the cross-roads, means road-users may potentially have a greater awareness of their surroundings.

313. The susceptibility of rural residents in this area would be medium to high. While Slievenahanaghan Hill forms an important landform feature in the local landscape, the principal orientation of the houses is generally in the opposite direction and this reduces the susceptibility of residents to the effects of the Development. Furthermore, the presence of Operational Corkey Windfarm establishes this type of development as a feature of the baseline views. These factors reduce the susceptibility of viewers to the effects of the Development, as it would have a limited influence on direct views and would be replacing an existing feature, albeit with turbines notably larger in scale.

314. The combination of the value and the susceptibility would give rise to an overall **medium** sensitivity for road-users and residents in the Lislaban area.

6.8.2.3 Magnitude of Change

315. The wireline in **Figure 6.24** shows that all five Development turbines would be theoretically visible set on, or behind, the ridgeline of Slievenahanaghan Hill. They would replace the existing influence of the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. The closest Development turbine would be seen at a distance of 3.58 km from the viewpoint.

316. During the decommissioning of Operational Corkey Windfarm, the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during the construction of the Development, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this distance, while the main track leading onto the hill forms an existing and relatively discreet feature. Furthermore, the general activity associated with the decommissioning and construction, with movement of vehicles on and off Site and other associated works would add to the overall effect. The magnitude of change during the combined decommissioning and construction phase would be **medium to high**. The tall cranes and turbines at various stages of decommissioning and construction would form a notable feature on Slievenahanaghan Hill that would draw the attention of road-users and residents.

317. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of residents and road-users in the Lislaban area during the operational stage;

- The range of the Development at 3.57 km would mean that the Development turbines would present a readily visible and often dynamic feature on this locally prominent hill;
- Although no direct scale comparison would occur, initially the Wind Turbines of the Development would be perceived to have a larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The scale of the Development turbines in relation to the scale of Slievenahanaghan Hill and the field pattern apparent across the upper slopes, would reduce the perceived scale of the hill; and

- While Gruig Windfarm would not be readily visible from this area, a scale comparison with the domestic turbines at Reservoir Road 1 and Gruig Lane would accentuate the larger scale of the Development turbines, in the context of a baseline that already contains scale comparisons.

318. The following factors would moderate the magnitude of change on the views of residents and road-users in the Lislaban area during the operational stage;

- The baseline presence of Operational Corkey Windfarm would mean that the Development would be constructed on a Site where windfarm development is an established baseline feature;
- The absence of Gruig Windfarm in the view avoids comparisons of scale from arising which would otherwise accentuate the scale of the Development turbines (although this may occur to a lesser degree with the smaller domestic turbines);
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent, appearing contained on the ridgeline of Slievenahanaghan Hill and avoiding the spread of this influence into neighbouring landforms or different sectors of the view, in particular the closer range and more prominent Gruig Hill; and
- The turbines would appear evenly spaced and form a tidy composition that appears appropriate in this upland landscape.

319. Taking all these factors into account, the magnitude of change on the views of residents and road-users as a result of the operational stage of the Development would be **medium to high**.

6.8.2.4 Significance of Effect

320. The effect of the Development on road-users and residents would be **significant** during the initial decommissioning, construction and operational phases. This finding relates chiefly to the relatively close range of the Development to Lislaban Road and properties in this area and the increased influence that the larger turbines would have on the character of the views, despite there being a current influence from Operational Corkey Windfarm.

6.8.3 Viewpoint 3: Reservoir Road

6.8.3.1 Baseline

321. This viewpoint is located on Reservoir Road which is the minor road that connects Corkey Road in the west with Altnahinch Road in the east. It follows a south-west to north-east alignment, passing over the northern flank of Slievenahanaghan Hill. The elevated viewpoint offers an open view south towards the Site and west across the valley of the River Main. The viewpoint is representative of the views of road-users on Reservoir Road and residents in the few properties dispersed across this upland area. Beyond the village boundary of Corkey, there are two farmsteads and one individual dwelling accessed from Reservoir Road. None of the properties have direct views towards the Site, but some would potentially gain oblique views or views from their grounds and approaches.

322. The contrasts of this upland hill compared to the lowland valley to the west are evident in this view. As Reservoir Road passes up the steep slope, the road-side enclosure from trees and hedgerow reduces to reveal an open and exposed landscape. Slievenahanaghan Hill lies to the immediate south, where the fields of improved pasture, enclosed by post and wire fencing, extend up to the hill top of rough grassland and moorland land cover. Whilst there are few landscape features in this upland area, man-made features are evident in the form of wind turbines. Operational Corkey Windfarm is visible on the hill top, albeit with only three turbines and three blades visible, the remaining four being screened by the hill itself. One turbine and two blades of neighbouring Gruig Windfarm are visible to the right, as well as two single turbines, one at close range to the right and one more distant to the left. These wind turbines establish this type of development as a feature of the baseline view.

6.8.3.2 Sensitivity

323. The value of the views from Reservoir Road is medium to high. While the viewpoint lies on the western edge of the national landscape designation of the Antrim Hills and Coast AONB, much of the view is contained in the viewshed to the west, which is not part of the AONB. The presence of operational, single and commercial wind turbines moderates the scenic quality experienced by road-users and residents.

324. The susceptibility of road-users on Reservoir Road would be medium to high. The road passes within approximately 1.15 km of the nearest turbine, such that road-users would experience close range views. The susceptibility is prevented from being rated high by the existing influence of windfarm development on this hill, the transient nature of the views of road-users, the absence of any formal laybys and the draw of views to the west as well as east. This means that the Development would not be introducing a new type of development, but instead extending the influence of an existing type.

325. The susceptibility of residents on Reservoir Road would be medium to high. The visual amenity of the farmstead on the north of Reservoir Road would not be affected owing to the enclosure of farm buildings around the farmhouse. The farmstead on the south of Reservoir Road is more exposed and the orientation of the farmhouse is such that visibility of the Development may occur at an oblique angle from the rear windows as well as more directly from the garden grounds and approach. The other property, on the south of Reservoir Road and further east, is orientated south-west such that it would not gain direct views from its interior, although views may be gained from the garden grounds despite enclosure from vegetation.

326. The combination of the value of the view and the susceptibility of road-users and residents on Reservoir Road gives rise to an overall **high** sensitivity.

6.8.3.3 Magnitude of Change

327. The wireline in **Figure 6.25** shows that all five Development turbines would be visible with the closest located 1.15 km from the viewpoint. The two closest turbines would be seen at full height, while the towers of the remaining three would be largely screened by the brow of Slievenahanaghan Hill. The Development turbines would be seen to the left of the operational Gruig turbines, which would also be screened by the brow of the hill, and behind the Reservoir Road 1 domestic turbine and to the right of the Reservoir Road 2 turbine.

328. The close proximity of this viewpoint means that processes associated with the decommissioning of Operational Corkey Windfarm and construction phase of the Development would be readily apparent, most notably the use of tall cranes and the presence of turbines in various states of decommissioning and construction, which would give rise to a fragmented appearance across parts of the skyline. The construction compound and control building would not be readily visible from this viewpoint owing to their location over on the lower south-western flank of the hill. The access tracks would connect into the turbines from this side of the hill, also reducing their visibility from this northern side, although earthworks around the base of T3 would also be visible and would form a small scale change to the profile of the ridgeline. The magnitude of change during the combined decommissioning and construction stage would be **high**. The tall cranes and turbines at various stages of decommissioning and construction would form a notable feature on Slievenahanaghan Hill that would draw the attention of road-users and residents.

329. During operation, it would be the presence of the Development turbines and the movement of their blades that that would form the main feature in these close range views. The following criteria would add to the magnitude of change on the views of road-users and residents on Reservoir Road, during operation;

- The distance of 1.15 km to the nearest turbine would make the Development a prominent feature from the road and from nearby residential properties, grounds or approaches where visibility occurs;
- The higher elevation of the Development turbines relative to the elevation of Reservoir Road and associated properties would add to their prominence;
- The Development turbines would appear large in scale in relation to the scale of Slievenahanaghan Hill which, from this close range viewpoint, is reduced because only the top is visible and the full height of the hill is not appreciated;
- Visibility from the central section of Reservoir Road would be almost continuous; and
- The smaller scale of operational Gruig Windfarm and the wooden utility poles would accentuate the larger scale of the Development turbines through comparison in the context of a baseline which already contains variance in scale.

330. The following criteria would moderate the magnitude of change on the views of road-users and residents on Reservoir Road during operation;

- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as a location for windfarm development;
- The small number of turbines and their compact horizontal extent would mean they would appear clearly associated with Slievenahanaghan Hill;
- The closer range single turbines act to moderate the perceived scale of the Development turbines;
- While the Development would have a notable effect on the views of residents and road-users, the influence of Gruig Windfarm is moderated by its less prominent location offset from the ridgeline of Slievenahanaghan Hill and the smaller scale of the turbines and this would reduce the combined effect;
- The replacement of Operational Corkey Windfarm with the Development means that it would not be introducing a new type of development into this sector of the view; and
- The principal orientation of the residential properties on Reservoir Road is west across the open valley of the River Main.

331. Taking all these factors into account, the overall magnitude of change on road-users and residents on Reservoir Road during operation would be **medium to high**.

6.8.3.4 Significance of Effect

332. The effect of the Development on the views of road-users and residents on Reservoir Road would be **significant** during both the initial decommissioning, construction stage and operational stage. This effect relates chiefly to the close proximity of these visual receptors to the Development and their larger vertical scale in comparison to Operational Corkey Windfarm, Gruig Windfarm and the wooden utility poles, despite the more favourable comparison with the closer range single turbines.

6.8.4 Viewpoint 4: Loughgiel

6.8.4.1 Baseline

333. This viewpoint is located on Lough Road, which forms the western approach into Loughgiel. Clear views towards the Site are experienced from much of the length of Lough Road, apart from in localised sections where vegetation or buildings enclose the view. In the main part of Loughgiel, the enclosure of the buildings prevents such open views towards the Site although glimpsed views can be experienced. The viewpoint is representative of the views of road-users and residents in and around Loughgiel.

334. Lough Road is a long straight road which creates a vista towards Loughgiel Catholic Church a prominent, light-rendered building at the end of the road. The village of Loughgiel is predominantly aligned along Corkey Road, such that the majority of properties face either east or west. While a variety of orientations occur in the modern developments to the east of Corkey Road, few are aligned towards the Site and often the enclosure of surrounding buildings or vegetation encloses the views in this direction.

335. Development occurs intermittently along Lough Road, set amidst small fields of improved pasture with fragmented hedgerow and tree belt enclosure, all of which establish a rural setting. The agricultural field pattern extends across the wider landscape and onto the upland landscape to the east. Settlement is also evident in the form of individual or clustered dwellings, often made distinct by their white render. Along the upland ridgeline, rough grassland and moorland replace improved pasture as the land cover. The field pattern is no longer evident and although the contrast is subtle, this upland area appears more open and less modified. It is on this ridgeline that six of the Operational Corkey Windfarm turbines are visible. They are seen as relatively small and distant features.

6.8.4.2 Sensitivity

336. The value of the views from Loughgiel is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints in the village or surrounding rural area; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

337. The susceptibility of road-users on Lough Road would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from much of Lough Road, apart from where vegetation and built development screen views within localised sections. The principal focus of the view is the church at the end of the vista and the view to the Development would occur in a direction almost perpendicular to the line of travel for east-bound road-users. While for east-bound road-users, the Development would form a readily apparent landform feature, the baseline influence from Operational Corkey Windfarm reduces their susceptibility, as the Development would not introduce a new feature, but instead a larger version of an existing feature with fewer turbines.

338. The susceptibility of residents in and around Loughgiel would be medium to high. While Slievenahanaghan Hill forms an important landform feature in the local landscape, it is not always directly visible from properties, garden grounds or streets, owing to the enclosure of other buildings and vegetation. Where visibility of the Development would occur, views would occur at an oblique angle to the alignment of the landform and pattern of the town, which is predominantly westwards. Furthermore, the presence of Operational Corkey Windfarm establishes this type of development as a feature of the baseline where there are views towards the Site. This reduces the susceptibility of viewers to the effects of the Development, as it would be seen to be replacing an existing feature, albeit with fewer turbines, which are larger in scale. There are also closer range influences from wind turbines, including the single turbine which sits to the north of Loughgiel Community Centre and the nine turbines of Altaveedan further to the north-east, visible from parts of the settlement and surrounding roads.

339. The combination of the value and the susceptibility would give rise to an overall **medium to high** sensitivity for residents and road-users in Loughgiel.

6.8.4.3 Magnitude of Change

340. The wireline in **Figure 6.26** shows that all five Development turbines would be theoretically visible set on or partially behind the ridgeline of Slievenahanaghan Hill. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five across a slightly wider section of the skyline. The closest Development turbine would be seen at a distance of 3.88 km. Operational Gruig Windfarm would be screened by the brow of Slievenahanaghan Hill and operational Altaveedan would be partly screened by intervening built form and vegetation, albeit with visibility occurring from parts of the settlement and surrounding roads.

341. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during the construction of the Development, the tall cranes and the emerging Development turbines would form the main feature, giving rise to widespread activity on the skyline. Other infrastructure, such as the construction compound, control building and access tracks would not be visible from this viewpoint, owing to their location predominantly on the lower south-western hill slopes. The magnitude of change during the decommissioning and construction phase would be **medium to high** as the presence and activity of the tall cranes, along with the construction and decommissioning of the turbines and other infrastructure would form a notable feature that would draw the attention of road-users and residents.

342. During operation, the effects would relate principally to the presence of the Development turbines and the movement of their blades. The following factors would add to the magnitude of change on the views of residents and road-users in the Loughgiel area during operation;

- The range of the Development at 3.88 km would mean that the Development turbines would present a readily visible and often dynamic feature on this local hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The Development turbines would not be as evenly spaced or relate as well to the shape of the ridgeline, as they do from other viewpoints; and
- The Development turbines would be associated with the well-defined enclosing ridgeline to this valley landscape and this would add to their prominence.

343. The following factors would moderate the magnitude of change on the views of residents and road-users in the Loughgiel area;

- The existing presence of Operational Corkey Windfarm would mean that the Development would be constructed on a Site where windfarm development is an established baseline feature;
- The absence of Gruig Windfarm in the view avoids comparisons of scale from arising which would otherwise accentuate the scale of the Development turbines;
- The closer range of the single turbine at Loughgiel Community Centre and Altaveedan Windfarm establish a baseline influence that would reduce the additional influence of the more distant Development;
- Visibility of Slievenahanaghan Hill to its full height would reduce scale comparisons which would otherwise reduce the perceived scale of the hill;
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent and would avoid spreading this influence into neighbouring landforms or different sectors of the view; and
- The turbines would be separated from the visual receptors by a substantial area of farmland and appear appropriate in this small area of distinctly upland landscape.

344. Taking all these factors into account, the magnitude of change on the views of road-users and residents as a result of the operation of the Development would be **medium**.

6.8.4.4 Significance of Effect

345. The effect of the Development on road-users and residents would be **significant** during the combined decommissioning and construction stage and during the operational stage. Despite the position of Loughgiel relative to the position of the

Development, whereby Loughgiel's predominant orientation is west and the location of the Development is south-east, the relatively close proximity of the Development, the prominence of the ridgeline and the larger scale of the Development turbines would make them the defining feature of views where they occur.

6.8.5 Viewpoint 5: Altnahinch Road south

6.8.5.1 Baseline

346. The viewpoint is located at the southern end of Altnahinch Road, close to the junction with Old Cushendun Road. Altnahinch Road extends over the western edge of the Antrim Hills and follows the northerly course of the Bush River to Glenbush Road. It is a single track road with passing places, with no road markings and few signs. There are no residential properties and no publicly accessible walking routes associated with this section of the road. The viewpoint is, therefore, representative of the views of road-users in this southern section of Altnahinch Road.

347. The view is characterised by the upland landscape of these low foothills on the western edge of the Antrim Hills. Whilst extensive tracts of commercial forestry occur across the hills to the east, the hills on this western edge are covered in open moorland and from this viewpoint the extent of the forestry is not evident. Rough grassland and heather form the predominant land cover and although post and wire fencing occurs in places, the character of the landscape is open and exposed. The hills are smooth and rounded, creating a simple appearance with no distinct landscape features.

348. In terms of interventions in this landscape, windfarms form the most notable example. Operational Corkey Windfarm is readily visible on the ridge of Slievenahanaghan Hill to the north, while operational Gruig Windfarm is seen to the fore, set in the trough between Slievenahanaghan Hill and Gruig Hill. The closer range of Gruig Windfarm accentuates the difference in scale with Operational Corkey Windfarm and ensures that the two windfarms are seen as distinct developments. The presence of the corrugated iron shed in the foreground and the road passing through the hills are further interventions, which in conjunction with the windfarms, reduce the sense of remoteness and the undeveloped nature of this landscape.

6.8.5.2 Sensitivity

349. The value of the view is medium to high. The viewpoint and much of the view lies on the western edge of the national landscape designation of the Antrim Coast and Glens AONB. While this formal recognition of the scenic value raises the value of the view, the marginal location of the viewpoint and the presence of existing commercial wind turbines, moderates this value. These hills are not publicly accessible and therefore views are largely restricted to road-users on Altnahinch Road.

350. The susceptibility of north-bound road-users on the southern end of Altnahinch Road would be medium. The viewpoint is located approximately 3.58 km from the nearest turbine and, although the road to the north passes closer, intervening landform would screen views of the Development. The susceptibility is also prevented from being rated high by the existing influence of windfarm development on this hill, especially with operational Gruig Windfarm present in the foreground. This means that the Development would not be introducing a new type of development, but instead extending the influence of an existing type. Furthermore, the nature of road-users' views is transient and therefore for a limited duration and this also moderates susceptibility.

351. The combination of the value of the view and the susceptibility of north-bound road-users on the southern section of Altnahinch Road gives rise to an overall **medium to high** sensitivity.

352. **Magnitude of Change**

353. The wireline in **Figure 6.27** shows that all five Development turbines would be visible with the closest located 3.58 km from the viewpoint. The extent to which the turbines would be visible would vary depending on the extent to which the hilltop would screen the towers, with the closest turbine seen at full height, the two to the right seen almost at full height and the towers of the two to the left largely screened by Slievenahanaghan Hill from the viewpoint. The Development turbines would be seen to the immediate right of the operational Gruig Windfarm turbines, the majority of which would be seen on the downslope of Gruig Hill, with those on the left partially screened by the intervening landform.

354. Slievenahanaghan Hill would form a screen to much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and the construction phase, such as the construction compound, control building and extension of access tracks. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. The magnitude of change during decommissioning and construction would be **medium to high**. The presence and activity of the tall cranes, and the construction and decommissioning of the turbines would form a notable feature at variance with the character of this unsettled and uncultivated landscape that would draw the attention of road-users.

355. During operation, it would be the presence of the Development turbines and the movement of their blades that that would form the main feature. The following criteria would add to the magnitude of change on the views of north-bound road-users on the southern section of Altnahinch Road;

- The distance of 3.58 km to the nearest turbine and the location of the Development on the ridgeline of Slievenahanaghan Hill would make it a prominent feature for north-bound road-users;
- The Development turbines would appear large in scale in relation to the scale of Slievenahanaghan Hill, which from this viewpoint would be reduced by only the top being visible;
- The central Development turbine would appear especially prominent owing to its full visibility and elevated position;
- The greater extent to which Gruig Windfarm is visible and its greater continuity with the Development, than from other viewpoints, means that the windfarm would appear as one development and this would increase the extent of windfarm development visible to road-users; and
- Visibility from the southern section of Altnahinch Road would continue over an approximate 1.4 km stretch for north-bound road-users, albeit with levels of visibility reducing with travel towards the north.

356. The following criteria would moderate the magnitude of change on the views of north-bound road-users on the southern section of Altnahinch Road;

- The open and simple nature of this upland landscape reduces the potential for comparisons of scale to arise with landscape features or landscape patterns that would otherwise accentuate the larger scale of the Development turbines;
- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as a location for windfarm development;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill;
- The replacement of Operational Corkey Windfarm with the Development means that it would not be introducing a new type of development into this sector of the view;
- The closer proximity of Gruig Windfarm means that the variance in relation to the size and scale of the Development turbines would not be readily apparent; and
- The compatibility in scale would mean the Development would appear as an extension to Gruig Windfarm and this continuity would avoid the accentuation of the larger scale of the Development turbines.

357. Taking all these factors into account, the overall magnitude of change on north-bound road-users on the southern section of Altnahinch Road during operation would be **medium**.

6.8.5.3 Significance of Effect

358. The effect of the Development on road-users on the southern section of Altnahinch Road would be **significant** during decommissioning / construction and **not significant** during operation. Despite the Development turbines increasing the scale compared to the Operational Corkey Windfarm turbines, a more compatible relationship with Gruig Windfarm would arise that would help to reduce the overall effect.

6.8.6 Viewpoint 6: Altnahinch Reservoir

6.8.6.1 Baseline

359. This viewpoint is located at the car park on the south-west side of Altnahinch Reservoir. The reservoir sits in the valley of the Bush River. It was built in 1967 and comprises a concrete dam at the northern end with the river feeding in from the southern end. It is accessed from Altnahinch Road to the west, with a small car park near the water's edge and a private access road extending around the northern side and crossing a bridge over the top of the dam. There is access for anglers and walkers around the reservoir such that views of Slievenahanaghan Hill can be experienced from the opposite side. The viewpoint is representative of the views of recreational users of the dam, including anglers and walkers, as well as the views of road-users on this central section of Altnahinch Road. There are no residential properties in this central section of Altnahinch Road.

360. The view shown in **Figure 6.30** looks south-west towards the Site. Beyond the foreground of the car park and deciduous tree cover, Slievenahanaghan Hill forms the defining feature with its smooth and gently undulating ridgeline, and rough grassland and moorland land cover. Eight of the Operational Corkey Windfarm turbines can be seen either set along this ridgeline or

tucked just behind it. Although they establish windfarm development as a feature associated with Slievenahanaghan Hill, their relatively small scale means that they do not form a prominent feature. To the north, lies Altaveedan Windfarm, seen as nine turbines, albeit with some overlap and screening from intervening forestry. While these add to the cumulative effect, their relatively low-lying location in the wider view, limits their influence on the experience of viewers.

361. Within the wider 360 degree view from the viewpoint, the view to the Site is not the main attraction. The attention of viewers is drawn towards the reservoir and the dam. The valley landscape is shaped around the river and the reservoir and this channels views inwards, with the enclosing hills forming more of a background feature. To the east, the enclosing hills are blanket covered in blocks of commercial forestry. This presents a contrasting character to the open moorland of Slievenahanaghan Hill to the west, as the forestry has created an enclosed and more modified landscape. Altaveedan Windfarm to the north adds further to the extent of human intervention visible in this landscape.

6.8.6.2 Sensitivity

362. The value of the view is medium to high. The viewpoint and much of the view is covered by the national landscape designation of the Antrim Coast and Glens AONB. While this formal recognition of the scenic value raises the value of the view, the marginal location on the western edge of the designated area and the presence of large swathes of commercial forestry to the east and the intervention of the concrete dam to the north, moderates the scenic quality. The reservoir is a popular location for anglers and walkers and this adds to the local value of the view.

363. The susceptibility of recreational users at the reservoir and road-users on Altnahinch Road would be medium to high. While the main focus of visitors is the reservoir, Slievenahanaghan Hill forms an important part of the landscape setting to the reservoir and wider valley. The susceptibility is prevented from being rated high owing to the existing influence of windfarm development on this hill, although part of the purpose of recreational users visiting this location relates to an appreciation of the surrounding landscape.

364. The susceptibility of road-users on the central section of Altnahinch Road would be medium to high. The road passes within approximately 1.26 km of the nearest proposed Wind Turbine, such that road-users would experience close range views. The western road-side is mostly open such that clear views of the Site occur from the central section of this road, albeit with landform forming screening further south. As above, the susceptibility is prevented from being rated high owing to the existing influence of windfarm development on this hill.

365. The combination of the value of the view and the susceptibility of viewers at Altnahinch Reservoir and the central section of Altnahinch Road, gives rise to an overall **medium to high** sensitivity.

6.8.6.3 Magnitude of Change

366. The wireline in **Figure 6.28** shows that all five Development turbines would be visible with the closest located 1.24 km from the viewpoint. The three closest turbines would be visible to practically their full extent, while the two slightly more distant turbines would be screened by the top of Slievenahanaghan Hill such that they would only be visible as blades. In comparison to Operational Corkey Windfarm, the Development would occupy a similar horizontal extent, albeit shifted slightly to the right, but owing to the larger turbines would notably increase the vertical extent. Operational Gruig Windfarm is not visible in this view.

367. Slievenahanaghan Hill would form a screen to much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and construction of the Development, such as the construction compound, control building and extension of access tracks. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. The earthworks around the base of T2 may also form an apparent feature, albeit of a much smaller scale. The magnitude of change during the combined decommissioning and construction would be **high** largely owing to the proximity of these features and their elevated position above the reservoir.

368. During operation, it would be the presence of the Development turbines and the movement of their blades that that would form the main feature. The following criteria would add to the magnitude of change on the views of recreational users of Altnahinch Reservoir and road-users of the central section of Altnahinch Road;

- The distance of 1.26 km to the nearest turbine would make the Development a prominent feature from the Altnahinch Reservoir and central section of Altnahinch Road;
- The Development turbines would appear larger in scale than the scale of Slievenahanaghan Hill from this viewpoint;
- The location of the Development turbines on the ridgeline and the lower lying elevation of the reservoir and the road would further accentuate their scale;
- Slievenahanaghan Hill forms an important part of the setting to the reservoir and the association of the Development with this hill would raise its prominence;
- Visibility from the central section of Altnahinch Road would be almost continuous along a length of approximately 1.1 km; and
- The Development would compete with Altnahinch Reservoir as the main focus in local views.

369. The following criteria would moderate the magnitude of change on the views of recreational users and road-users during operation;

- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as a location for windfarm development;
- The presence of the reservoir, the dam and large scale commercial forestry denotes the extent of human intervention in this landscape and it is in this context that the Development would have a lesser effect than if located in a completely unmodified landscape;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill;
- The replacement of Operational Corkey Windfarm with the Development means that it would not be introducing a new type of development into this sector of the view;
- Although the larger Development turbines would add more to the cumulative effect, the limited influence of Altaveedan owing to its low-lying location, would ensure the overall cumulative effect would be limited.

370. Taking all these factors into account, the overall magnitude of change on recreational users and road-users during operation would be **high**.

6.8.6.4 Significance of Effect

371. The effect of the Development on the views of recreational users at Altnahinch Reservoir and road-users on the central section of Altnahinch Road would be **significant** during both the initial decommissioning / construction and operational phases. This finding relates chiefly to the close proximity of the Development, and the increase in scale of the Development turbines compared to the Operational Corkey Windfarm turbines.

6.8.7 Viewpoint 7: Slieveanorra

6.8.7.1 Baseline

372. This viewpoint is located on the summit of Slieveanorra (508m AOD) on the western side of the Antrim Hills. This is one of the most accessible hills owing to a wide gravel track passing over the summit from the south-west to the north-east and connecting to Altnahinch Road to the west and Altarichard Road to the east. The track provides access to the two masts which mark the summit, as well as the extensive commercial forest which covers the lower and middle slopes. Slieveanorra forms a high point along the Moyle Way long distance route and is a relatively popular hill with walkers owing to the panoramic view available from the summit.

373. The view from the summit is expansive in all directions, with views extending towards the Sperrins to the west, the west coast of Scotland to the north-east, Rathlin Island to the north and Slemish to the south. The Antrim Hills characterise the surrounding landscape with their gentle undulations and well-rounded summits, which merge collectively into long and low ridgelines. While most of the upland summits are retained as open moorland, the broad and expansive Slieveanorra Forest blankets most of the surrounding hill slopes. This land cover does not appear natural owing to the single species, single age, geometric edges and breaks, and blocks of clear-felling. Furthermore, the presence of the access track and the masts on the summit of Slieveanorra detract from any sense of remoteness or wildness that might otherwise have arisen within this upland landscape.

374. The view towards the Site is characterised by the distinctive ridgeline between Gruig Hill and Slievenahanaghan Hill. Here open moorland is evident in the mottled brown landcover and the ridgeline is marked by a series of ten turbines belonging to Operational Corkey Windfarm. To the left lies the operational Gruig Windfarm, set in a trough below the ridgeline such that the larger scale of the turbines compared to the Operational Corkey Windfarm turbines is not readily evident. Altnahinch Reservoir and farm fields denote the human influence in the Bush River Valley and with the lower-lying valley landscapes visible further west, this hill ridge forms a clear definition to the western extent of the Antrim Hills.

6.8.7.2 Sensitivity

375. The value of the view is medium to high. Slieveanorra is publicly accessible and its coincidence with the Moyle Way long distant path adds to its value. The viewpoint and much of the view lies in the western side of the national landscape designation of the Antrim Coast and Glens AONB. While this formal recognition of the scenic value raises the value of the view, the presence of the masts at the summit, the wide forestry access track and the extensive commercial forestry across the hill slopes, moderates this value through a reduction in its scenic quality. Furthermore, the presence of Altnahinch Reservoir and the improved pasture of the farmland in the intervening landscape, denote the human modification of the wider landscape.

376. The susceptibility of walkers on Slieveanorra would be medium. The viewpoint is located approximately 4.88 km from the nearest turbine. The Development would occupy only a small proportion of this south-west sector of the view and a much smaller proportion of the panoramic view. Furthermore, the south-west sector is one of the less remarkable sectors in terms of scenic interest, although the Slievenahanaghan Hill ridge does from a distinctive landform feature. The susceptibility is also prevented from being rated high by the existing influence of windfarm development on Slievenahanaghan Hill, including Operational Corkey Windfarm and Gruig Windfarm. This means that the Development would not be introducing a new type of development, but instead increasing the influence of an existing type within the same location.

377. The combination of the value of the view and the susceptibility of walkers on Slieveanorra gives rise to an overall **medium to high** sensitivity.

6.8.7.3 Magnitude of Change

378. The wireline in **Figure 6.29** shows that all five Development turbines would be visible with the closest located 4.88 km from the viewpoint. The three turbines to the fore would be seen to practically their full height, while the two turbines to the rear would have the bases of their towers screened by Slievenahanaghan Hill. The Development turbines would be seen to the right of the operational Gruig Windfarm turbines, which would be seen in the trough below the hill. In comparison to Operational Corkey Windfarm, the Development would occupy similar horizontal extents, albeit shifted slightly to the right, but owing to the larger turbines would increase the vertical scale.

379. Slievenahanaghan Hill would form a screen to much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and construction of the Development, such as the construction compound, control building and extension of access tracks. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. These would give rise to a **medium to high** magnitude of change as they would be visible along this prominent ridgeline and appear at variance with the character of this upland landscape.

380. During operation, it would be the movement of the turbine blades that that would form the main feature. The following criteria would add to the magnitude of change on the views of walkers on Slieveanorra, during operation;

- The distance of 4.88 km to the nearest turbine and the location of the Development on the hilltop would make it a readily apparent feature in the views of walkers, albeit with existing windfarm development already present in the same sector;
- Despite the proximity of the Development to Gruig Windfarm, the variance in scale would ensure these two windfarms would be seen as separate developments and the location of the Development to the fore of Gruig Windfarm would accentuate the prominence of the Development;
- The Development turbines would appear large in scale in relation to the scale of the hills, and in relation to the smaller scale of the operational Gruig turbines; and
- The Development turbines would appear prominent owing to their location along the ridgeline.

381. The following criteria would moderate the magnitude of change on the views of walkers on Slieveanorra during operation;

- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as a location for windfarm development;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill and occupy only a small proportion of the wider view;
- Variances in the scale between Gruig Windfarm and the Development would be seen in a context in which variances in the scale of turbines form an established part of the baseline character;
- The presence of the masts, forestry and farm access tracks, field boundaries and Altnahinch Reservoir would moderate the effects of the Development by presenting a context in which the landscape has already been modified by human interventions;
- The Development would be seen on the western edge of the Antrim Hills and in the least remarkable sector of the view; and
- The distance of 4.88 km to the nearest Development turbine and the location of the Development on a ridgeline separated by an intervening valley and forest would ensure the Development would be seen as a contained feature within a wider landscape setting.

382. Taking all these factors into account, the overall magnitude of change on the views of walkers on Slieveanorra during operation would be **medium to low**.

6.8.7.4 Significance of Effect

383. The effect of the Development on the views of walkers on Slieveanorra would be **significant** during the combined decommissioning / construction stage and during the operational stage (borderline). This finding relates chiefly to the prominence of the turbines on the ridgeline at the relatively close range of 4.88 km, despite the existing influence that windfarm development and other human artefacts and modifications have in this least remarkable sector of the view, and the small proportion of the wider view that would be affected, with the more attractive sectors remaining unaffected.

6.8.8 Viewpoint 8: Ballycregagh Road, Clough Mills

6.8.8.1 Baseline

384. This viewpoint is located on Ballycregagh Road on the south side of the small town of Clough Mills. In contrast to the lower landform and enclosure from buildings which occurs in most of the town, the rising landform towards the south of the town coupled with the partially open aspect from this rural edge, ensures more open views occur towards the Site. The view looks north-east across the agricultural landscape towards the foothills of the Antrim Hills, where the Site is located. The viewpoint is representative of the views of road-users on Ballycregagh Road and residents in Clough Mills.

385. On this southern side of Clough Mills, the landscape is characterised by the combination of the gently undulating landform and agricultural land uses. Small to medium sized fields of improved pasture and arable crops are enclosed by a mix of post and wire fencing, hedgerows and occasional tree belts. This provides some containment to the landscape and partially screens views out to the low hills which enclose the valley to the west and east. As well as being a cultivated valley, this is also a settled valley and the urban edge of Clough Mills is evident from Ballycregagh Road. Recent small scale residential developments occur along the southern settlement boundary, denoting the expanding nature of this town.

386. Slievenahanaghan Hill and Gruig Hill are visible to the north-east, seen as relatively distant and low hills, their prominence reduced by the rising foreground landform in this direction. Operational Corkey Windfarm, on the ridge of Slievenahanaghan Hill, and operational Gruig Windfarm, set in the trough to the right, are visible from this section of the road to the south of Clough Mills. While the turbines raise the prominence of these hills, they also appear as small scale and distant and occur very much as a background feature to a view defined by the fore to middle ground of the rural landscape.

6.8.8.2 Sensitivity

387. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on Ballycregagh Road or in the town; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

388. The susceptibility of road-users on Ballycregagh Road would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from much of Ballycregagh Road, apart from where landform cutting, vegetation and built development would screen views within localised sections. Although the view to the Development would occur at an oblique angle to the direction of road-users and views may be partially screened by intervening vegetation, the minor status of this road and the slower speeds of vehicles means road-users may potentially have a greater awareness of their surroundings.

389. The susceptibility of residents in Clough Mills would be medium. The town follows an insular pattern of development whereby properties face inwards onto traditional street spaces. There is, therefore, no direct association between the layout of the town and Slievenahanaghan Hill, where the Site is located and views of the Site occur incidentally. Actual visibility from

properties is generally limited by the enclosure of other surrounding buildings and while some visibility may occur from properties on the edge of the settlement, streets and garden grounds, Slievenahanaghan Hill forms more of a background feature rather than the focus of views. Furthermore, the presence of Operational Corkey Windfarm and Gruig Windfarm establish this type of development as a feature of the baseline views. This reduces the susceptibility of viewers to the effects of the Development, as it would be seen to be replacing an existing feature, albeit with turbines appearing larger in scale.

390. The combination of the value and the susceptibility would give rise to an overall **medium** sensitivity for residents and road-users on Ballycregagh Road and in Clough Mills.

6.8.8.3 Magnitude of change

391. The wireline in **Figure 6.30** shows that all five Development turbines would be theoretically visible set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen evenly spaced and of relatively even elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. The closest Development turbine would be seen at a distance of 6.07 km. The Development would be seen to the left of operational Gruig Windfarm containing this influence within the upland area. Despite their proximity, they would be seen as separate developments owing to the small separation gap and the variance in scale.

392. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building, access tracks and existing main track would not be readily visible from this distance. The magnitude of change during these initial phases would be **medium**. While the tall cranes, decommissioning and construction of turbines would form a notable feature on this locally prominent hill, the separation distance combined with the extent of enclosure within the surrounding area would moderate the effect.

393. During operational phase the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of residents and road-users in the Clough Mills area during operation;

- The separation distance of 6.07 km would mean that the Development turbines would present a visible and often dynamic feature on this locally prominent hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would initially be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines; and
- The effect of the Development in conjunction with Gruig Windfarm would increase the influence of windfarm development from this sector of the view.

394. The following factors would moderate the magnitude of change on the views of residents and road-users in the Clough Mills area during operation;

- The existing presence of Operational Corkey Windfarm would mean that the Development would be constructed on a Site where windfarm development is an established baseline feature, albeit occupying a reduced horizontal extent;
- The proximity of the Development to Gruig Windfarm would help to contain the extent of influence from this type of development within the same upland area;
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent without extending into neighbouring landforms or different sectors of the view;
- The Development would be seen at an oblique angle to the direction of road-users and this would reduce its prominence in views;
- Slievenahanaghan Hill, with which the Development would be associated, appears as a background feature in the view, with the surrounding agricultural landscape having a more immediate influence on the character of view; and
- The turbines would appear evenly spaced and form a tidy composition that appears appropriate in this upland landscape.

395. Taking all these factors into account, the magnitude of change on the views of residents and road-users in the Clough Mills area as a result of the Development during construction and operation would be **medium**.

6.8.8.4 Significance of Effect

396. The effect of the Development on the views of road-users on Ballycregagh Road and residents in Clough Mills would be **not significant.** This finding relates chiefly to the existing influence that windfarm development has in this sector of the view and despite the increase in scale of the Development turbines, the separation distance combined with the small proportion of the wider view the Development would occupy and the urban influences evident in the wider view, would moderate the overall effect.

6.8.9 Viewpoint 9: B94 over A26 west of Clough Mills

6.8.9.1 Baseline

397. This viewpoint is located on the B94 where it crosses over the A26, just west of the town of Clough Mills. The A26 is the main north to south road between Ballymena and Coleraine, forming part of the important link to Belfast City. Traffic flows on the A26 are typically heavy and traffic speeds are typically fast. Much of the section to the west of Clough Mills is enclosed by cutting such that views towards the Site are screened. In contrast, the B94 is elevated where it crosses the A26 and for east-bound road-users, this road aligns towards Slievenahanaghan Hill. The viewpoint is representative of road-users on this road and not local residents as views from nearby properties are typically lower-lying with views screened by intervening landform or vegetation.

398. The roads are the characterising feature in this view, with the recently implemented A26 and B94 overbridge, introducing heavily engineered and modern features in this otherwise, traditional and rural landscape. Beyond the localised influence of these busy roads, the character of the surrounding landscape is defined primarily by the agricultural land-use. Small to medium sized farm fields of improved pasture and arable crops, and enclosed by hedgerows and fencing, create a pattern across this low-lying and gently undulating valley landscape. Occasional tree cover adds to the sense of enclosure and the rural character of this landscape.

399. Despite the extent to which the upland landscape is visible from this viewpoint is limited by the intervening landform of the valley landscape, operational Gruig Windfarm is still visible, seen in the trough to the right of Slievenahanaghan Hill. This increases the influence of windfarm development in this sector of the views and further establishes it as a feature of this upland landscape.

6.8.9.2 Sensitivity

400. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on the B94; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. Furthermore, the presence of the busy A26, B94 overbridge and all the associated crash barriers and lighting detract from the rural value of this area. There is, however, a local value associated with the visual amenity of road-users, and this establishes a medium rating.

401. The susceptibility of road-users on the B94 would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from the short section of the B94 where it crosses the A26. While the Development would also be visible from sections of this road to the west, the distance would be greater and the alignment not directly towards the Site, as it is from this viewpoint. This alignment would accentuate the prominence of the Development in the views of east-bound road-users. Their susceptibility would, however, be modified by the separation distance and the existing influence of Operational Corkey Windfarm and operational Gruig Windfarm on these views.

402. The combination of the value of the view and the susceptibility of road-users, would give rise to an overall **medium** sensitivity.

6.8.9.3 Magnitude of Change

403. The wireline in **Figure 6.31** shows that five of the Development turbines would be theoretically visible from this viewpoint, with turbines overlapping. The Development turbines would be seen set on or behind the ridgeline of Slievenahanaghan Hill. Owing to the overlap, they would not be seen evenly spaced as they are from other viewpoints but would be seen to be relatively even in elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. The closest Development turbine would be seen at a distance of 6.55 km.

404. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the

construction compound, control building, access tracks and existing main track would not be readily visible from this distance. The magnitude of change during the decommissioning and construction phases would be **medium**. This finding relates chiefly to the distance between the viewpoint and the Development and the limited extent to which visibility would occur across the adjacent sections of road.

405. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of east-bound road-users on the B94 overbridge during operation;

- The distance of 6.55 km to the nearest turbine would mean that the Development would present a visible feature on this locally prominent hill;
- The alignment of this short section of the B94 towards the Development would accentuate its prominence in views;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m); and
- The scale of the Development turbines in relation to the scale of Slievenahanaghan Hill and the operational Gruig turbines would accentuate the larger scale of the Development turbines.

406. The following factors would moderate the magnitude of change on the views of east-bound road-users on the B94 overbridge during operation;

- The effect on this road would be most notable over the short section on the overbridge owing to its elevated position, with the effect on other sections being limited by intervening landform and vegetation, and greater separation distances and the oblique views.
- The baseline presence of Operational Corkey Windfarm and Gruig Windfarm would mean that the Development would be constructed in an upland area where windfarm development is an established baseline feature;
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent;
- The background role of Slievenahanaghan Hill, within the wider view would reduce the prominence of the Development with the surrounding roads having a more immediate influence on the character of the views; and
- The Development turbines would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view.

407. Taking all these factors into account, the magnitude of change on the views of road-users as a result of the operation of the Development would be **medium**.

6.8.9.4 Significance of Effect

408. The effects of the Development on the views of east-bound road-users on the B94 overbridge would be **not significant** during the initial decommissioning / construction and operational phases. This finding relates chiefly to the distance of the Development from the viewpoint combined with the limited extent of road over which east-bound road-users would be affected. These factors mean that despite the larger scale of the Development turbines and the alignment of this short section of the road towards them, they would not redefine the character of the view.

6.8.10 Viewpoint 10: Tullaghans Road, Dunloy

6.8.10.1 Baseline

409. This viewpoint is located on Tullaghans Road in the village of Dunloy. Tullaghans Road extends west from the central crossroads in the settlement, across the rising landform from where an uninterrupted and elevated view towards the Site can be experienced. This viewpoint is representative of the views of residents in Dunloy as well as road-users on Tullaghans Road and other surrounding roads. Views from the lower residential streets and lower roads are typically screened in part by intervening buildings or vegetation.

410. The alignment of the roads and settlements follows the alignment of the landscape, with the south to north valley of the River Main and the parallel ridges of low hills to the west and east. Dunloy lies on the B16 on the western valley side of the River Main. To the west lies the long and low ridge of Long Mountain, while on the opposite side of the valley to the east lies Slievenahanaghan Hill and Gruig Hill marking the western edge of the Antrim Hills. Development is dispersed along the B16, giving the impression of a long linear settlement, with the principal orientation being eastwards across the valley. In reality, a number of modern developments sit in behind the main road and off the side roads, where the properties are typically inward looking, thus following a range of orientations.

411. The view is characterised by a valley landscape, modified by the settlement and cultivation by humans. Beyond the concentration at Dunloy, built development can be seen throughout the landscape, occurring as individual properties or as small clusters. The geometric pattern of small and medium fields of arable crops and improved pasture also extends across the valley. Enclosure is limited to occasional hedgerows and tree belts and in the absence of any substantial woodland cover, the landscape appears predominantly open with only localised enclosure. While the field pattern extends onto the low hills that enclose the eastern side of the valley, the upper slopes and tops present a less modified pattern where boundaries are not as apparent and darker land cover denotes moorland and rough grasslands. Windfarm development is visible in this upland landscape, with Operational Corkey Windfarm on Slievenahanaghan Hill, operational Gruig Windfarm in the trough to the right and Altaveedan Windfarm on the valley side to the left.

6.8.10.2 Sensitivity

412. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on Tullaghans Road or in Dunloy; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

413. The susceptibility of road-users on Tullaghans Road and the B16 would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible to east-bound road-users from much of Tullaghans Road, apart from where landform cutting, vegetation and built development screen views within localised sections. Although the view to the Development would occur at an oblique angle to the direction of road-users on the B16, the general openness of the valley landscape to the east naturally draws the attention of viewers towards the Antrim Hills on the opposite side.

414. The susceptibility of residents in Dunloy would be medium. In those parts of the town which follow an insular pattern of development, there is no direct association between the layout of the town and the Antrim Hills where the Site is located, and, therefore, views of the Site occur incidentally. In those other parts of the town, set across the valley side where their principal orientation is across the valley to the Antrim Hills, there is more of an association, and views of the Site are more readily apparent. Actual visibility from properties is generally limited by the enclosure of other surrounding buildings and vegetation, although some visibility may occur from properties on the eastern side with a less interrupted aspect. While the Antrim Hills form a distinct, albeit distant landform feature from the Dunloy area, the presence of operational windfarms establishes this type of development as a feature of the baseline views. This reduces the susceptibility of viewers to the effects of the Development, as it would be seen to be replacing an existing feature, albeit with turbines notably larger in scale.

415. The combination of the value and the susceptibility would give rise to an overall **medium** sensitivity for residents and road-users in the Dunloy area.

6.8.10.3 Magnitude of Change

416. The wireline in **Figure 6.32** shows that all five of the Development turbines would be visible from this viewpoint. The Development turbines would be seen set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen fairly evenly spaced and relatively even in elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five contained within a similar horizontal extent. The Development would occupy a small proportion of the much wider view available from this western side of the valley. The closest Development turbine would be seen at a distance of 10.02 km. Operational Gruig Windfarm is visible in the trough to the right of the Development, operational Altaveedan Windfarm is visible on the fringe of the valley further to the left and single and paired turbines are visible intermittently throughout the valley landscape.

417. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound and control building would not be readily apparent from this distance, owing to their comparatively small scale. The magnitude of change during the combined decommissioning and construction stage would be **medium to low**. This finding relates chiefly to the separation distance between the viewpoint and the Development which would ensure the cranes and turbines would form small scale and relatively distant features.

418. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of road-users and residents in and around Dunloy during operation;

- All five of the Development turbines would be readily visible set along the ridgeline of the Antrim Hills, albeit occupying a small proportion of the wider skyline;
- The Antrim Hills form an enclosing ridgeline from this western side of the valley and the association of the Development with this distinctive landform feature raises its prominence in views from this area;
- The natural draw of the views of residents and road-users eastwards across the valley towards the Antrim Hills would increase the influence of the Development; and
- The Development turbines would add to the existing influence of Gruig Windfarm and the scale comparison between the turbines would accentuate the larger vertical scale of the Development turbines with them also appearing in front of the Gruig turbines. This will occur in the context of a baseline which contains scale comparisons.

419. The following factors would moderate the magnitude of change on the views of road-users and residents in and around Dunloy during operation;

- The separation distance of 10.02 km from the viewpoint means that the Development would appear as a relatively small and distant feature, occupying a small proportion of the wider view, and the larger scale of the Development turbines would not be so readily evident;
- The Development turbines would be seen in the context of the maximum height of Slievenahanaghan Hill and this would produce less of a scale comparison with the hill, that would moderate the perceived scale of the Development turbines;
- The extent of the intervening valley landscape would emphasise the separation between Dunloy and the Development and reduce its influence on road-users and residents;
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent and avoid spreading this influence into neighbouring landforms or different sectors of the view;
- The replacement of the Operational Corkey Windfarm turbines with the Development turbines on the same Site would ensure that the Development would not be introducing a new influence; and
- The Development turbines would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view.

420. Taking all these factors into account, the magnitude of change on the views of road-users as a result of the Development during operation would be **medium to low**.

6.8.10.4 Significance of Effect

421. The effect of the Development on the views of road-users and residents in and around Dunloy would be **not significant**. The Development would appear as a relatively small scale and distant feature, occupying a small proportion of the wider view, and although the increase in the scale of the turbines would be apparent, it would not redefine the character of the view.

6.8.11 Viewpoint 11: Ballyweeny, Ballyveely Road

6.8.11.1 Baseline

422. The viewpoint is located at Ballyweeny on the Ballyveely Road, a minor road that connects The Drones in the north and Clough Mills in the south. Ballyweeny comprises a series of residential properties and Ballyweany Presbyterian Church, these buildings dispersed intermittently along the western side of Ballyveely Road. They are all orientated eastwards to gain views across the rural landscape. The Site lies towards the east. The viewpoint is representative of the views of road-users on the Ballyveely Road and residents of Ballyweeny.

423. The surrounding landscape is characterised by gently undulating landform overlain with a geometric field pattern defined by fencing, hedgerows and occasional tree belts and containing predominantly improved pasture. This is a well-managed agricultural landscape, with hedgerow and tree enclosure adding to the scenic quality of the rural character. While some views are partially contained by tree cover, most are open, with visibility extending eastwards to the western ridgeline of the Antrim Hills. The contrast between these two landscapes is evident, most notably owing to the elevated and rounded landform of the foothills, the broader pattern and darker colouring of the rough grassland and moorland landcover, and the apparent absence of settlement.

424. Operational Corkey Windfarm is readily visible, set along the hilltop of Slievenahanaghan Hill and operational Gruig Windfarm seen set in the trough of the ridgeline to the right. Furthermore, two single turbines are visible, one set on the lower slopes to the fore of Operational Corkey Windfarm and one to the left. These developments form an association between the foothills landscape and windfarm development. In respect of the views from Ballyveely Road, Ballweeny village and the surrounding roads and residential properties, the Antrim Hills form the enclosing edge to the valley landscape, and although the windfarm developments raise their prominence, the view is largely defined by the more immediate rural landscape.

6.8.11.2 Sensitivity

425. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on Ballyveely Road or in Ballyweeny; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

426. The susceptibility of road-users on Ballyveely Road and other surrounding roads would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from much of Ballyveely Road, apart from where landform, vegetation and built development screens views within localised sections. Although the view to the Development would occur at an oblique angle to the direction of road-users, the minor status of this road and the slower speeds of vehicles means road-users may potentially have a greater awareness of their surroundings.

427. The susceptibility of residents in Ballyweeny would be medium to high. While the orientation of the properties is east towards the Antrim Hills, many are single storey such that the presence of hedgerows and occasional tree cover to the east reduces the openness of the view in this direction. Nonetheless, at a range of approximately 4 km, Slievenahanaghan Hill forms an important landform feature within local views. The presence of Operational Corkey Windfarm, however, establishes this type of development as a feature of the baseline views. This reduces the susceptibility of viewers to the effects of the Development, as it would be seen to be replacing an existing feature and occupying a reduced horizontal extent, albeit with turbines notably larger in scale.

428. The combination of the value and the susceptibility would give rise to an overall **medium to high** sensitivity for residents in Ballyweeny and road-users on Ballyveely Road.

6.8.11.3 Magnitude of Change

429. The wireline in **Figure 6.33** shows that all five Development turbines would be theoretically visible set on or behind the ridgeline of Slievenahanaghan Hill. The three closest turbines would be seen to their full height, while the towers of the two turbines to the rear would be partially screened by the hilltop. The Development turbines would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. The closest Development turbine would be seen at a distance of 3.68 km.

430. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this distance. The magnitude of change during the combined decommissioning and construction phases would be **medium to high**. This finding relates to the separation distance of 3.68 km which means the tall cranes and turbines would form a readily visible feature, furthermore they would be associated with this locally prominent hill. The magnitude of change is moderated by the extent of localised enclosure which occurs in this area and the baseline influence of windfarm developments on Slievenahanaghan Hill.

431. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of residents and road-users in the Ballyweeny area during the operational stage;

- The range of the Development at 3.68 km would mean that the Development turbines would present a readily visible and often dynamic feature on this locally distinctive hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);

- The limited extent to which the height of Slievenahanaghan Hill is visible would increase the scale comparison in which the larger scale of the turbines would be accentuated; and
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines with the Development turbines also appearing in front of the Gruig turbines which would accentuate the larger scale of the Development turbines in the context of a baseline which already contains scale comparisons.

432. The following factors would moderate the magnitude of change on the views of residents and road-users in the Ballyweeny area during the operational stage;

- The replacement of the Operational Corkey Windfarm turbines with the Development turbines on the same Site would ensure that the Development would not be introducing a new influence;
- The small number of Development turbines means they would form a relatively compact group with no greater horizontal extent than Operational Corkey Windfarm;
- The Wind Turbines would appear evenly spaced, albeit with an incidence of overlap between T1 and T4;
- The limited horizontal extent of the Development would mean that in conjunction with Gruig Windfarm, the extent of windfarm development on this ridgeline would not increase (although the Development turbines would be more prominent owing to larger scale);
- The Development would occupy only a small proportion of the wider view, with much of the wider view characterised by the enclosure of the closer-range and gently undulating landscape;
- Although Slievenahanaghan Hill forms an important landform feature from this valley landscape, enclosure from intervening hedgerows, tree cover, built form and localised landform, reduces actual visibility and therefore the influence of the Development; and
- The Development turbines and Gruig turbines would appear contained on the ridgeline of Slievenahanaghan Hill and would avoid spreading this influence into neighbouring landforms or different sectors of the view.

433. Taking all these factors into account, the magnitude of change on the views of residents as a result of the Development during operation would be **medium**.

6.8.11.4 Significance of Effect

434. The effect of the Development on the views of road-users on Ballyveely Road and residents in and around Ballyweeny would be **significant** during initial decommissioning / construction and operational phases. Despite the existing association of Slievenahanaghan Hill with windfarm development combined with the enclosure of parts of this area, the larger scale of the Development turbines would form a prominent feature that would redefine the character of views in this area.

6.8.12 Viewpoint 12: Altnahinch Road north

6.8.12.1 Baseline

435. This viewpoint is located in the northern section of Altnahinch Road which lies to the north of the Site. The viewpoint is representative of the views of road-users on Altnahinch Road and residents in surrounding properties. Altnahinch Road is long and straight with open views along most of its length. Settlement in this landscape is typically dispersed with intermittent farmsteads and isolated properties set onto the road or accessed from it.

436. The landscape character of the valley of the River Bush is distinct from the landscape character of the valley of the River Main, which lies parallel to the west on the opposite side of the low foothills, seen in the right of the view. The differences relate to the upland landform which is less productive in agricultural terms. This has led to larger fields of semi-improved or unimproved grassland for livestock grazing. The smooth rounded hills are generally open with a lesser extent of enclosure from hedgerows or tree cover. While the primary land use in the valley and on the lower slopes is agriculture, commercial forestry covers much of the wider landscape and this adds to the upland character and further accentuates the distinction.

437. Development in the valley is typically small scale and rural, albeit with some of the farmsteads comprising larger farm sheds. The less intensive farming practices, compared to the valley of the River Main, means the landscape generally appears less modified, although the presence of commercial forestry adds to its wider modified state. It is within the foothills to the east and the south that that the presence of Altaveedan Windfarm and Operational Corkey Windfarm establish large scale windfarm development as a feature of this upland landscape. The ten turbines of Operational Corkey Windfarm are seen set along the summit of Slievenahanaghan Hill, with the closer range single turbine seen in the fold between the hills and a single blade of operational Gruig Windfarm to the left.

6.8.12.2 Sensitivity

438. The value of the view is medium to high. The viewpoint and much of the wider view to the north-east, east and south-east lies within the western edge of the national landscape designation of the Antrim Coast and Glens AONB. While this formal recognition of the wider scenic value raises the value of the view, the marginal location of the viewpoint in respect of the AONB boundary and the presence of existing commercial wind turbines and commercial forestry moderates the overall scenic quality. The close range hills are not publicly accessible and, therefore, views are largely restricted to south-bound road-users and residents on this northern end of Altnahinch Road.

439. The susceptibility of south-bound road-users on the northern end of Altnahinch Road would be medium to high. The viewpoint is located approximately 2.55 km from the nearest turbine and the road to the south passes closer. Open views occur along the length of the road apart from closer to the junction with Reservoir Road where occasional road-side planting would screen views of the Development. While the susceptibility is prevented from being rated high by the existing influence of Operational Corkey Windfarm and Gruig Windfarm on this area and the transient nature of the views of road-users, the close proximity of the Development and the alignment of the road towards the Development for south-bound road-users ensures a medium to high susceptibility.

440. The susceptibility of residents on Altnahinch Road would be medium to high. The properties on Altnahinch Road and recessed off it, all face in towards the road such that their orientation is either north-east or south-west. This means that none of the properties are orientated south towards the Site and, while some residents may gain oblique views from side windows, for the majority of residents, their principal views from internal living spaces would not be directly affected. Views from garden grounds and driveways would, however, be more likely to be affected. The susceptibility of residents would also be moderated by the existing influence from Operational Corkey Windfarm to the south and Altaveedan Windfarm to the north-west.

441. The combination of the value of the view and the susceptibility of south-bound road-users and residents on the northern section of Altnahinch Road gives rise to an overall **medium to high** sensitivity.

6.8.12.3 Magnitude of Change

442. The wireline in **Figure 6.34** shows that all five Development turbines would be visible with the closest located 2.55 km from the viewpoint. The extent to which the turbines would be visible would vary depending on the extent to which the hilltop would screen the towers, with the three closest turbines seen practically at full height, the tower of the turbine to the right seen partially screened and the turbine in the middle seen as a blade. The Development turbines would be seen to occupy a similar extent of Slievenahanaghan Hill as Operational Corkey Windfarm, albeit with notably larger turbines. The cumulative effect would occur principally between the Development and Altaveedan Windfarm, as visibility of Gruig Windfarm from this northern section of Altnahinch Road is limited.

443. Slievenahanaghan Hill would form a screen to much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and construction of the Development, such as the construction compound, control building and extension of access tracks, although vehicles and plant would be visible along the skyline. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. The magnitude of change during the combined decommissioning and construction phases would be **medium to high**. This finding relates to the separation distance of 2.55 km which means the tall cranes and turbines would form a readily visible feature, furthermore they would be associated with this locally prominent hill and seen from a valley which channels views towards its skyline. The magnitude of change is moderated by the existing influence of Operational Corkey Windfarm to the south and Altaveedan Windfarm to the north which establish windfarm development as a baseline feature of this area.

444. During operation, it would be the presence of the Development turbines and the movement of their blades that that would form the main feature. The following criteria would add to the magnitude of change on the views of road-users and residents on the northern section of Altnahinch Road during the operational stage;

- The distance of 2.55 km to the nearest Development turbine and the location on the summit of Slievenahanaghan Hill would make the Development a prominent feature for residents and south-bound road-users;
- The scale of the Development turbines would appear large in relation to the scale of Slievenahanaghan Hill and this would accentuate their prominence in the views of residents and south- bound road-users;
- Visibility from the northern section of Altnahinch Road would continue over an approximate 3.6 km stretch, albeit with levels of visibility reducing in localised areas with road-side vegetation; and

- The orientation of the road to the south would ensure the Development would be prominent in views of south-bound road-users and while none of the properties are orientated directly towards the Development it would be potentially visible from rear and side windows, garden grounds and access tracks. Views which already receive views of windfarm development in the form of Operational Corkey Windfarm and Altaveedan.

445. The following criteria would moderate the magnitude of change on the views of road-users and residents on Altnahinch Road during the operational stage;

- This upland area has a simpler and more open landscape pattern which reduces the visual discord between the landscape and the Development turbines, that is evident in views from the valley landscape to the west;
- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as an existing location for windfarm development;
- The small number of turbines and their reduced horizontal extent would mean they would appear contained on Slievenahanaghan Hill;
- The Wind Turbines would appear evenly spaced and without incidence of overlap;
- The orientation of most of the properties to either the south-west or the north-east would reduce the occurrence of direct views from internal living spaces; and
- The replacement of the Operational Corkey Windfarm turbines with the Development turbines on the same Site would ensure that the Development would not be introducing a new influence.

446. Taking all these factors into account, the overall magnitude of change on residents and road-users on the northern section of Altnahinch Road during construction and operation would be **medium to high**.

6.8.12.4 Significance of Effect

447. The effect of the Development on the views of south-bound road-users and residents on the northern section of Altnahinch Road would be **significant.** The close range of Altnahinch Road and associated properties to the Development would mean that the larger turbines would redefine the character of the views of south-bound road-users and residents, despite Operational Corkey Windfarm and Altaveedan Windfarm forming an influence on their baseline views.

6.8.13 Viewpoint 13: Cemetery near Glarryford

6.8.13.1 Baseline

448. This viewpoint is located at the Ballymurris Presbyterian Church Cemetery to the north of Glarryford. It has been selected to represent the views of visitors to the church and cemetery, as well as residents and road-users in the local area. The open aspect of the cemetery to the north-east allows clear views towards Slievenahanaghan Hill. The cemetery is accessed by Dunminning Road which forms part of the rural network of minor roads. Views from the road are mostly enclosed by hedgerows, albeit with sufficient open sections to allow views towards the Site to be experienced by road-users.

449. The landscape is characterised by the broad and gently undulating valley of the River Main and its principal use as agricultural land. Fields of improved pasture and arable crops occupy the valley floor. Hedgerows and tree cover occur only intermittently, such that the landscape lacks enclosure and views are typically open, extending either to the middle ground or all the way to the foothills of the Antrim Hills, which form the backdrop in views to the east. Settlement within this area is typically dispersed, with rural farmsteads and isolated properties spread throughout the rural landscape with variable extents of outlook depending on the enclosure of localised vegetation. In contrast, a concentration of properties occurs around Station View cul-de-sac in Glarryford. Here, views are mostly inward looking or obscured by neighbouring properties or vegetation.

450. The view to the north-east looks out across the valley to the distant ridgeline formed by the Antrim Hills. Slievenahanaghan Hill is made distinct by the presence of Operational Corkey Windfarm along its summit and Gruig Hill by operational Gruig Windfarm set in the trough to the right. A small number of the operational Altaveedan turbines are visible in a trough to the left and single or pairs of domestic wind turbines set throughout the valley add further to the overall picture of windfarm development.

6.8.13.2 Sensitivity

451. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on Dunminning Road, Station Road or in Glarryford; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

452. The susceptibility of road-users on Dunminning Road and Station Road would be medium. North-bound road-users would be more susceptible to the effects of the Development as it would be seen in the forward field of view, albeit at an oblique angle to the north-east. Fragmented hedgerows occur along the road-sides and this combined with tree cover across the fore to middle ground of the valley landscape, reduces the extent to which road-users experience clear views of Slievenahanaghan Hill. Owing to its pattern, content and depth, the valley landscape defines the character of the views and the Antrim Hills occur as a more distant background feature.

453. The susceptibility of residents in Glarryford and surrounding rural areas would be medium to low. Few properties experience direct or clear views towards the Development, largely owing to their orientation in other directions or the screening effect of intervening vegetation. The settlement follows an insular pattern of development whereby properties face inwards onto street spaces. Furthermore, Slievenahanaghan Hill forms a background feature rather than the focus in views and the presence of Operational Corkey Windfarm and Gruig Windfarm to the north-east, establishes this type of development as a feature of the baseline views. This reduces the susceptibility of residents to the effects of the Development, as it would be seen to be replacing Operational Corkey Windfarm, albeit with turbines notably larger in scale.

454. The combination of the value and the susceptibility would give rise to an overall **medium** sensitivity for residents and road-users in the Glarryford area.

6.8.13.3 Magnitude of Change

455. The wireline in **Figure 6.35** shows that all five of the Development turbines would be visible from this viewpoint. The Development turbines would be seen set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen very evenly spaced and relatively even in elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. The closest Development turbine would be seen at a distance of 10.26 km. All ten of the operational Gruig turbines are visible on the downslope of Gruig Hill to the right of the Development.

456. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this distance. The magnitude of change during the combined decommissioning and construction phases would be **medium to low**. This finding relates chiefly to the separation distance between the viewpoint and the Development which would moderate the visual influence of the cranes and turbines. It also takes into account the extent of localised screening and the influence of baseline windfarm developments in views from this area.

457. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of road-users and residents in and around Glarryford, during the operational stage;

- All five of the Development turbines would present a clearly visible windfarm on the ridgeline of this background hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines; and
- The Development in conjunction with Gruig Windfarm would increase the influence of windfarm development along this upland ridge.

458. The following factors would moderate the magnitude of change on the views of road-users and residents in and around Glarryford, during the operational stage;

- The distance of the Development from the viewpoint means that it would appear as a relatively small and distant feature and the larger scale of the Development turbines would not be so readily evident;
- The prominence of the Development would be moderated by the background role of Slievenahanaghan Hill within the view, with the intervening valley landscape having more of an influence on the character of the view;

- The extent of visibility would be limited owing to the screening effect of intervening vegetation across the valley landscape;
- The small number of Development turbines and their even layout means they would form a relatively compact group with a reduced horizontal extent;
- The location of the Development and Gruig Windfarm in the same upland landscape and the same sector of the view would avoid spreading this influence into neighbouring landforms or different sectors of the view; and
- The closer range of Garves and Glenbuck Windfarms would make them a more prominent feature from parts of this area and through comparison would reduce the prominence of the Development.

459. Taking all these factors into account, the magnitude of change on the views of road-users and residents in the Glarryford area as a result of the Development would be **medium to low**.

6.8.13.4 Significance of Effect

460. The effect of the Development on the views of road-users and residents in the Glarryford area would be **not significant**. This finding relates chiefly to the distance of the Development from the viewpoint which means that it would appear as a relatively distant and small scale feature and although the Development turbines would appear larger, they would not redefine the character of the view which would continue to be defined principally by the surrounding valley landscape.

6.8.14 Viewpoint 14: Kilmandil Road

6.8.14.1 Baseline

461. This viewpoint is located on Kilmandil Road which is a rural road approximately 5 km to the west of the Site. The viewpoint is representative of the views of east-bound road-users on this road, as well as residents in the surrounding rural area. Kilmandil Road has been selected because it aligns towards the Site, such that east-bound road-users experience clear views of the Site, albeit only over short sections where landform and vegetation do not screen visibility. Individual farmsteads and properties and clusters of properties occur across this area, either set along the roadside or offset along short access tracks. Settlement is dispersed such that its influence spreads over much of the rural area rather than being contained within defined village areas.

462. Although the ZTV in **Figure 6.36** shows that theoretical visibility would extend along the full length of Kilmandil Road, actual visibility would be reduced to the western end and the eastern end, with views from the majority of the road being obstructed by intervening road-side tree cover, localised landform or surrounding buildings. Similarly, the extent of visibility from properties is variable, albeit with most enclosed by surrounding vegetation or other buildings, especially in the many examples of larger farm complexes.

463. The surrounding landscape is gently rolling and characterised largely by fields of improved pasture as well as arable crops. Tree cover and hedgerows are slightly more extensive in this area and these add to the rural character and, in localised areas, the containment of views. The foothills of the Antrim Hills can be seen to the east where they enclose the valley landscape with a long and low ridgeline. Slievenahanaghan Hill is seen as a subtle high point along this ridgeline and is more notably marked by the presence of Operational Corkey Windfarm. Operational Gruig Windfarm is also visible to the immediate right of Operational Corkey Windfarm, albeit to a lesser extent owing to its lower elevation.

6.8.14.2 Sensitivity

464. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on Kilmandil Road or in the other surrounding rural roads; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. There is, however, a local value associated with the visual amenity of residents and road-users, and this establishes a medium rating.

465. The susceptibility of road-users on Kilmandil Road and other surrounding roads would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible only from certain sections of Kilmandil Road, owing to landform, vegetation and built development screening views from other sections. The alignment of some open sections of this road towards the Development would increase the susceptibility of east-bound road-users to the effects. The minor status of this road and the slower speeds of vehicles means road-users may also have a greater awareness of their surroundings.

466. The susceptibility of residents in this rural area would be medium to high. While the orientation of many of the properties is north or south onto Kilmandil Road, some are orientated east towards the foothills. Few, however, gain clear views owing to the extent of vegetation or proximity of other buildings. Where views from properties do occur, Slievenahanaghan Hill forms an enclosing ridgeline to the valley, rather than any special focus. Furthermore, the presence of Operational Corkey Windfarm establishes this type of development as a feature of the baseline views. This reduces the susceptibility of viewers to the effects of the Development, as it would be seen to be replacing an existing feature, albeit with turbines notably larger in scale.

467. The combination of the value and the susceptibility would give rise to an overall **medium to high** sensitivity for residents and road-users on Kilmandil Road.

6.8.14.3 Magnitude of Change

468. The wireline in **Figure 6.36** shows that all five Development turbines would be theoretically visible set on or behind the ridgeline of Slievenahanaghan Hill. The three closest turbines would be seen practically to their full height while the towers of the two turbines to the rear would be partially screened by the hilltop. The Development turbines would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five to occupy a reduced horizontal extent. The closest Development turbine would be seen at a distance of 5.32 km.

469. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. While other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this distance, the main track leading onto the hill may be apparent and this would add to the overall effect. The magnitude of change during the combined decommissioning and construction stage would be **medium**. Despite the separation distance between the viewpoint and the Development and the localised enclosure which reduces the extent of actual visibility across this area, the alignment of Kilmandil Road towards Slievenahanaghan Hill would raise the prominence of the tall cranes and turbines set along the ridgeline.

470. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of east-bound road-users and residents along Kilmandil Road;

- The range of the Development at 5.32 km would mean that the Development turbines would present a readily visible feature on this locally distinctive hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The scale of the Development turbines in relation to the operational Gruig turbines would accentuate the larger scale of the Development turbines, albeit seen in the context of a landscape where variance in turbine scale is widely evident; and
- The alignment of some open sections of the road towards the Development would accentuate its prominence in views.

471. The following factors would moderate the magnitude of change on the views of road-users and residents along Kilmandil Road, during the operational stage;

- The existing presence of Operational Corkey Windfarm means that the Development would be constructed on a Site where windfarm development is an established baseline feature;
- The small number of Development turbines and their even spacing means they would form a relatively compact group with limited horizontal extent that would occupy only a small proportion of the wider view;
- The extent of visibility across this area would be limited owing to the screening effect of intervening landform and vegetation across the valley landscape;
- Slievenahanaghan Hill appears as a small section of the enclosing edge to the valley landscape, with the surrounding agricultural landscape having a wider influence on the character of the view; and
- The location of the Development and Gruig Windfarm in the same upland landscape and the same sector of the view would avoid spreading this influence into neighbouring landforms or different sectors of the view.

472. Taking all these factors into account, the magnitude of change on the views of road-users and residents on Kilmandil as a result of the operation of the Development would be **medium**.

6.8.14.4 Significance of Effect

473. The effect of the Development on the views of east-bound road-users and residents would be **significant** during decommissioning / construction and the operational stage in those localised areas in and around Kilmandil Road, where visibility occurs. This is owing to the presence of the larger Development turbines and the alignment of some sections of the road towards them, despite the intermittent nature of the visibility, the separation distance from the Development and the existing association of Slievenahanaghan Hill with windfarm development.

6.8.15 Viewpoint 15: Slemish

6.8.15.1 Baseline

474. This viewpoint is located on the summit of Slemish Mountain (437m AOD). The distinctive shape of the mountain relates to its origins as a volcanic plug, with steep and rugged upper slopes rising up to a level summit. Its prominence in the landscape is accentuated by the relatively flat farmland that surrounds it. The historic and cultural importance of Slemish relates to St Patrick as it was here, that between the ages of 16 and 22, he was enslaved and made to work as a shepherd. Slemish is a popular visitor attraction and offers parking and a small visitor centre. The viewpoint is representative of the views of walkers on the mountain, where, for a relatively short climb, the view is rewarding.

475. The view from Slemish Mountain is panoramic; the relatively flat farmland surrounding the mountain allowing the view to open up in all directions. Views extend north-east towards the west coast of Scotland, north to the Antrim Hills and Coast, west to the Sperrin Mountains, south-west to Lough Neagh and south-east to the settled lowlands and Belfast City. The Site lies in the sector to the north, where Slievenahanaghan Hill can be seen as a small and distant landform feature, set on the western edge of the Antrim Hills. In clear conditions the turbines of Operational Corkey Windfarm and operational Gruig Windfarm are visible, although at a distance of approximately 20 km, they form very minor components in the view.

476. The view to the north is characterised by the contrast between the modified landscapes of the lowlands and the less modified landscapes of the uplands. The geometric pattern of farm fields extends across the low and gently undulating landform to present a largely open and well-managed landscape, with few natural areas other than occasional blocks of woodland or tree belts. Although no large settlements are evident in this sector, small scale settlement is dispersed throughout this rural landscape, and single turbines and electricity transmission lines add to the extent of infrastructure visible. In the upland landscape, the landscape pattern is much broader with a large scale mosaic of coniferous plantations and open moorland covering the hills. Settlement is not evident in this landscape and there are generally fewer point features, with the exception of windfarm developments.

6.8.15.2 Sensitivity

477. The value of the view is high. Slemish is of historic and cultural importance owing to its association with St Patrick. It is publicly accessible and a popular visitor attraction, with the primary purpose being to enjoy the view from the summit, making it a recognised viewpoint. The viewpoint and much of the view to the north and east, lies in the western side of the national landscape designation of the Antrim Coast and Glens AONB. These factors all add to the value of the view.

478. The susceptibility of walkers on Slemish to the effects of the Development would be low. The viewpoint is located approximately 20 km from the nearest Development turbine. This means the Development would occupy a very small proportion of this northern sector of the view and a much smaller proportion of the wider panoramic view. Furthermore, the northern sector is one of the less remarkable sectors in terms of scenic interest, although further north-east the more elevated Antrim Hills and the Antrim Coast present more of an attractive landscape. There is also an existing influence from operational windfarm developments on Slievenahanaghan Hill, which means that the Development would not be introducing a new type of development, but instead increasing the influence of an existing type within this localised section of the skyline.

479. The combination of the value of the view and the susceptibility of walkers on Slemish gives rise to an overall **medium** sensitivity.

6.8.15.3 Magnitude of Change

480. The wireline in **Figure 6.37** shows that all five Development turbines would be visible with the closest located 19.75 km from the viewpoint. The five turbines would be seen set evenly spaced along the rounded ridge of the distant Slievenahanaghan Hill. The Development turbines would be seen to the rear of the operational Gruig turbines, which would be seen in the trough below the hill. In comparison to Operational Corkey Windfarm, the Development would occupy similar horizontal extents, and, owing to the notable separation distance, the larger turbines would not necessarily be apparent. Operational Rathsherry and Elginny Hill would be readily visible to the north-west at 8.1 km and 8.3 km respectively. Their closer range to Slemish make them a more prominent feature, and by comparison, this reduces the prominence of the Development.

481. The distance of 19.75 km to the nearest turbine would mean that the smaller scale features associated with the decommissioning of Operational Corkey Windfarm and the construction of the Development, such as the construction compound, control building and extension of access tracks, would not be discernible. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction, although these would be small scale and distant. The magnitude of change during the combined decommissioning and construction phases would be **low**. This finding relates chiefly to the separation distance which would ensure that the cranes and turbines appear as relatively small components within a much wider view.

482. During operation, it would be the presence of the Development turbines that would form the main feature, with the separation distance possibly too great for the movement of the blades to be discernible. The following criteria would add to the magnitude of change on the views of walkers on Slemish;

- The presence of the Development on the western edge of the Antrim Hills would be visible in the views of walkers, albeit small scale at a distance of 19.75 km to the nearest turbine; and
- The Development turbines may appear slightly larger than the operational Gruig turbines, albeit in a view where a variety of turbine scales are evident.

483. The following criteria would moderate the magnitude of change on the views of walkers on Slemish during the operational stage;

- The distance of the Development from the viewpoint means that the Development turbines would appear as small scale and distant features;
- The Wind Turbines would occupy a very small proportion of the northerly sector of the view and an even smaller proportion of the wider panoramic view;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill and occupy a reduced horizontal extent;
- There would be a closer range influence from Elginny Hill and Rathsherry that would reduce the influence of the Development owing to its greater separation distance and therefore smaller scale;
- The location of the Development to the rear of Gruig Windfarm would ensure that windfarm development would be concentrated within this contained section of the skyline;
- The Development would be seen on the western edge of the Antrim Hills and in the least remarkable sector of the view where there is a baseline influence from windfarm development.

484. Taking all these factors into account, the overall magnitude of change of walkers on Slemish during operation would be **low**.

6.8.15.4 Significance of Effect

485. The effect of the Development on the views of walkers on Slemish would be **not significant** during the decommissioning, construction and operational phases. This finding relates chiefly to the substantial separation distance between Slemish and the Development which would ensure the Development turbines would appear as distant and small scale features with a limited influence on the views of walkers.

6.8.16 Viewpoint 16: A26 junction west of Clough

6.8.16.1 Baseline

486. This viewpoint is located on the bridge over the A26, approximately 3 km west of Clough. The A26 is the main north to south road between Ballymena and Coleraine, forming part of the main route to Belfast City. It is representative of the views of north-bound road-users on this section of the A26 and surrounding roads. While the ZTV in **Figure 6.38** shows theoretical visibility extending along much of the A26, actual visibility is notably reduced by the enclosure of roadside vegetation or the slight rise in the landform along the road edge. Glimpsed views of the Site are experienced by north-bound road-users travelling at speed, and from short sections where the vegetation and landform opens up. Furthermore, visibility of the Development from the A26 is typically at an angle to the direction of travel, especially through the closest section to the immediate west of the Site, where views are at a perpendicular angle.

487. The A26 is a busy road with two carriageways in each direction along some sections. Traffic flows can be heavy and traffic speeds fast, especially along the many long straight sections. Recent construction works have included resurfacing of the carriageways and the implementation of new and replacement bridges over the A26. The viewpoint is located at the bridge connecting the north-bound Clough junction with Clough, with the elevation of the bridge raising the perspective across the local landscape. The road, with its crash barriers, lighting, signage and junctions, forms a notable modern intervention which detracts from the rural character of the surrounding landscape.

488. The A26 follows the general south to north alignment of this valley landscape. The surrounding landscape is characterised by small and medium fields of arable crops and improved pasture. Farmsteads and small clusters of rural properties are evident from the road-side, along with occasional commercial or industrial developments benefiting from the good communication links the A26 has to offer. The hills to both the west and east of the valley feature in occasional longer range views, forming enclosure to the valley as well as a presenting a contrasting upland landscape character. Operational Corkey Windfarm is visible on Slievenahanaghan Hill from this more elevated viewpoint, the turbines seen as small scale features set along the open skyline. Gruig Windfarm is situated to the immediate right, although screened from this viewpoint by intervening tree cover. Other single turbines are readily evident in this sector of the view, adding to the overall influence of this type of development on the baseline character.

6.8.16.2 Sensitivity

489. The value of the view is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints on the A26; these factors denoting the absence of any recognised or formal value to the viewpoint or content of the view. Furthermore, the presence of the busy A26 and all the associated crash barriers and lighting detract from the rural value of this area. There is, however, a value associated with the visual amenity of road-users, especially in light of the high volume of vehicles that use this route.

490. The susceptibility of road-users on this section of the A26 and adjoining roads would be medium to low. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be readily visible from the short section to the west of the bridge crossing the A26. While the Development would also be visible from short sections of the A26, the limited extent of these views combined with the high speed of road-users would lead to glimpsed views of short duration. Furthermore, the Development would be visible to north-bound road-users at an oblique angle to the north-east but not readily visible to south-bound road-users. Susceptibility would also be modified by the separation distance and the existing influence of Operational Corkey Windfarm and operational Gruig Windfarm on these views.

491. The combination of the value of the view and the susceptibility of road-users, would give rise to an overall **medium** sensitivity.

6.8.16.3 Magnitude of Change

492. The wireline in **Figure 6.38** shows that all five of the Development turbines would be theoretically visible from this viewpoint. The Development turbines would be seen set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen evenly spaced and seen to be relatively even in elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. Although no direct scale comparison would be possible, as the 57 m tall Wind Turbines would be removed prior to the 137 m Wind Turbines being erected, a perceived increase would be based on people's recollection of the difference in the comparative scale of these Wind Turbines and the features of the landscape in the views. The closest Development turbine would be seen at a distance of 9.73 km and they would occur to the left of operational Gruig turbines, which are screened by intervening tree cover.

493. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this distance, and while the main track leading onto the hill would potentially be apparent during construction, this forms a baseline feature. The magnitude of change during the combined decommissioning and construction phases would be **medium to low**. This finding relates to a combination of the distance between the viewpoint and the Development and the limited extent of this area from which visibility would occur.

494. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of road-users on this section of the A26 and surrounding roads;

- Despite the separation distance of 9.73 km, the larger scale of the Development turbines means that they would present a readily visible feature on this background hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m); and
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines, albeit in a view where the variable scale of turbines forms a baseline feature.

495. The following factors would moderate the magnitude of change on the views of road-users on this section of the A26 and surrounding roads;

- The very limited extent to which predominantly north-bound road-users would experience views of the Development from this section of the A26 and surrounding roads, owing to intervening vegetation and landform;
- The notable separation distance of 9.73 km which means that the Development would appear as a minor feature where views do occur,
- The existing presence of Operational Corkey Windfarm would mean that the Development would be constructed on a Site where windfarm development is an established baseline feature;
- The small number of Development turbines means they would form a relatively compact group with a reduced horizontal extent; and
- Slievenahanaghan Hill, with which the Development would be associated, appears as a background feature in the view, with the surrounding roads infrastructure having a more immediate influence on the character of the view.

496. Taking all these factors into account, the magnitude of change on the views of road-users as a result of the Development during the operational stage would be **medium to low**.

6.8.16.4 Significance of Effect

497. The effect of the Development on the views of road-users on or over the A26 would be **not significant** during the construction and operational phases. This finding relates chiefly to the limited occurrence of visibility, the separation distance between the roads and the Development and the background appearance of Slievenahanaghan Hill and the Development relative to the context of the busy A26 and surrounding rural landscape.

6.8.17 Viewpoint 17: A26 south-east of Ballymoney

6.8.17.1 Baseline

498. This viewpoint is located on the A26 at the junction with Boyland Road, approximately 2km south-east of the town of Ballymoney. While the ZTV in **Figure 6.38** shows that theoretical visibility of the Development is continuous across the town, actual visibility is greatly reduced by the combination of the screening effect of buildings in the town, the screening effect of tree cover in the surrounding rural area, and the relatively low-lying and gently undulating landform of this area, which means there are few vantage points from which to experience wider views. The A26 is the main approach into Ballymoney and actual visibility of the Development from this route is also notably restricted by intervening tree cover, landform and buildings. The viewpoint, therefore, is located at the Boyland Road junction, to the south-east of the town, and is representative of the views of south-bound road-users on this section of the A26.

499. The rural landscape to the south of Ballymoney is more enclosed by hedgerows, tree belts and woodland than the rural landscape further south towards Ballymena. This enhances the character of the landscape by increasing the extent of enclosure and adding variance in terms of colour and texture. The broad woodland band that extends through the middle-ground of the view marks a distinct transition between the lowland valley and the upland hills. The long and low ridgeline of the upland hills appears as a background feature, enclosing the eastern side of the valley. The hills are made distinct from the valley by their simpler appearance, with broad and rounded landform, and larger blocks of forestry and moorland. While small scale rural development does not appear to extend onto the upland hills, the larger scale developments of windfarms are evident. Operational Corkey Windfarm is visible on Slievenahanaghan Hill, with Gruig Windfarm seen set on the lower hillslopes to the immediate right, Altaveedan Windfarm set on the valley edge to the left and a number of single turbines in both the valley and upland landscapes. In some conditions, the turbines back-clothed by the landform are seen as more prominent features than the turbines back-clothed by the open sky.

6.8.17.2 Sensitivity

500. The value of this view is medium. The viewpoint and the view are not covered by any national or regional landscape designations which would otherwise denote a special scenic value. The absence of a formal viewpoint or formal stopping points on this road, denotes a lack of recognised value, the volume of traffic on the A26 combined with the open and expansive nature of the view, raises its value to medium.

501. The susceptibility of road-users to the Development is medium. Despite the distance between the viewpoint and the Development, its location within the forward facing sector of the views of south-bound road-users, combined with the openness of the views towards Slievenahanaghan Hill where the Development would be located and the volume of road-users on the A26, raises their susceptibility to the potential effects.

502. The combination of the value of the view and the susceptibility of road-users on the northern section of the A26 gives rise to an overall **medium** sensitivity.

6.8.17.3 Magnitude of Change

503. The wireline in **Figure 6.39** shows that the closest turbine of the Development would be located 11.69 km from the viewpoint. All five of the turbines would be visible, seen set fairly evenly spaced on the rounded hilltop of Slievenahanaghan Hill. The five larger Development turbines (137m) would be seen to replace the ten smaller Operational Corkey Windfarm turbines (57m), within a similar horizontal extent. They would be seen set against the skyline, whilst neighbouring Gruig Windfarm to the right would be seen set against the backdrop of Gruig Hill.

504. During the decommissioning of the Operational Corkey Windfarm turbines and the emergence of the Development turbines the presence of cranes would form the main feature. Other construction infrastructure, such as access tracks and construction compounds would not form readily apparent features from this range. The magnitude of change during the combined decommissioning and construction stage would be **medium to low**. This finding relates to a combination of the separation distance between the viewpoint and the Development and the limited extent of the road from which visibility would occur.

505. During operation, it would be the presence of the Development turbines that would form the main feature at a separation distance of 11.69 km. The following criteria would add to the magnitude of change on the views of road-users on this section of the A26;

- The Development would be readily visible set along the elevated hilltop of Slievenahanaghan Hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The Development turbines would appear larger than the operational Gruig turbines and this difference in scale would accentuate the scale of the Development turbines, albeit in a landscape where variances in the scale of turbines is a baseline feature; and
- The Development would not add to the horizontal extent of windfarm development in this sector, compared to the baseline, but would add to the vertical extent and in conjunction with Gruig Windfarm this would marginally increase the influence of windfarm development on the views of road-users.

506. The following criteria would moderate the magnitude of change on the views of south- bound road-users;

- The separation distance of 11.69 km would mean that the Development would appear as a relatively small scale and distant feature which would occupy only a small extent of the wider view;
- The location of the Development in the distant upland landscape, separated from road-users by the broad valley landscape, would reduce the prominence of the Development;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill and occupy only a small proportion of the wider view;
- The presence of operational windfarms in the same sector of the view, means that the Development would not be introducing a new type of development into this sector of the view; and
- The view would continue to be characterised by the rural landscape, within which the Development would appear as a background feature.

507. Taking all these factors into account, the overall magnitude of change on south-bound road-users during the operational stage would be **medium to low**.

6.8.17.4 Significance of Effect

508. The effect of the Development on south-bound road-users in this section of the A26 would be **not significant** during the construction and operational phases. This finding relates chiefly to the distance between the viewpoint and the Development, which means that the Development would appear as a small scale and distant feature, occupying a very limited extent in a much broader view. Disparities in scale with Operational Corkey Windfarm and operational Gruig windfarm would be apparent but not notable from this range and seen in a context where variances in turbine scale forms a feature of the baseline context.

6.8.18 Viewpoint 18: Boghill, Long Mountain

6.8.18.1 Baseline

509. This viewpoint is located on the Glenbuck Farm track to the north of Glenbuck Road on Long Mountain. It is representative of the views of road-users, residents and walkers in the surrounding area. Although the ZTV in **Figure 6.10** shows theoretical visibility to be almost continuous across Long Mountain, intervening vegetation, localised landform and occasional built form reduces the extent of actual visibility. The Glenbuck Farm track allows a more open view across the valley of the River Main to Slievenahanaghan Hill than Glenbuck Road and other surrounding roads where roadside vegetation causes partial screening.

510. Long Mountain is a long and low ridge that encloses the western side of the River Main, following the north to south alignment of the uplands and valleys evident across the wider landscape. It separates the parallel valleys of the River Bann to the west and the River Main to the east. While small fields of improved pasture and arable crops cover the valley slopes, the upper plateau of Long Mountain is characterised by rough grassland and moorland, with a broad tract of commercial forestry occurring to the west of the viewpoint. There is a small loch to the north and a quarry to the north-east. While the character of this landscape is distinct from its surroundings, it is a relatively small area in which any sense of remoteness is dispelled by the influence of existing development, most notably, the operational turbines of Long Mountain windfarm to the immediate north-east.

511. Views from the eastern side of Long Mountain are naturally drawn eastwards across the valley to the distant foothills on the edge of the Antrim Hills. Collectively, these hills form a relatively long and low ridgeline without any distinct landscape features. Slievenahanaghan Hill is visible to the north-east of the viewpoint, where Operational Corkey Windfarm is visible along the ridgeline and operational Gruig Windfarm visible on the lower hill slopes to the right. Altaveedan Windfarm is visible further to the left, set on the edge of the valley. These developments establish windfarms as a baseline feature of the upland landscape, with Operational Corkey Windfarm occupying a small proportion of the broader extent of the view.

6.8.18.2 Sensitivity

512. The value of this view is medium. The viewpoint and the view are not covered by any national or regional landscape designations which would otherwise denote a special scenic value. While the absence of a formal viewpoint or formal stopping points on the nearby roads, denotes a lack of recognised value, the open and expansive nature of the view makes it of local value to residents, road-users and walkers.

513. The susceptibility of residents, road-users and walkers to the Development is medium to low. While the susceptibility of viewers relates principally to the draw of views from the western valley side to the eastern valley side, this is moderated by the distance between the viewpoint and the Development, and the extent to which tree cover and scrub limits clear views from many of the roads and properties.

514. The combination of the value of the view and the susceptibility of viewers gives rise to an overall **medium** sensitivity.

6.8.18.3 Magnitude of Change

515. The wireline in **Figure 6.40** shows that the closest turbine of the Development would be located 11.73 km from the viewpoint. All five of the turbines would be visible, with some overlapping, however this would only be evident from this location or others in a similar alignment. The turbines would be seen set on the distant ridgeline of Slievenahanaghan Hill, to the left of the ten operational Gruig turbines, which are set lower down on the hill side. They would occupy a small proportion of a much broader view in which turbines feature in a range of different sizes and scales.

516. The presence of the tall cranes, during the decommissioning of the Operational Corkey Windfarm turbines and the construction of the Development turbines would form the main features. Other construction infrastructure, such as access tracks and construction compounds would not form readily apparent features from this range. The magnitude of change during the combined decommissioning and construction stage would be **medium to low**. This finding relates to a combination of the separation distance between the viewpoint and the Development and the baseline influence of closer range operational windfarms on Long Mountain.

517. During operation, it would be the presence of the Development turbines that would form the main feature and the movement of the blades may be discernible despite the separation distance of 11.73 km. The following criteria would add to the magnitude of change on the views of road-users;

- Despite the distance of 11.73 km, the Development turbines would appear larger than the Operational Corkey Windfarm turbines and the operational Gruig turbines, and this difference in scale would increase the prominence of the Development turbines; and
- The Development would not add to the horizontal extent of windfarm development in this sector, compared to the baseline, but would add to the vertical extent and in conjunction with Gruig Windfarm this would marginally increase the influence of windfarm development on the views of road-users.

518. The following criteria would moderate the magnitude of change on the views of road-users;

- The distance of 11.73 km would mean that the Development would appear as a small scale and distant feature and would occupy only a small extent of the wider view;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill occupying slightly reduced horizontal extent compared to Operational Corkey Windfarm;
- The presence of operational windfarm development in the same sector of the view as the Development, means that the Development would not be introducing a new type of development into this sector of the view; and
- The presence of the closer range windfarm at Long Mountain would establish a scale comparison that would diminish the perceived scale and influence of the Development.

519. Taking all these factors into account, the overall magnitude of change on residents, road-users and walkers during the operational stage would be **medium to low**.

6.8.18.4 Significance of Effect

520. The effect of the Development on road-users on Long Mountain would be **not significant** during the operation and construction of the Development. This finding relates chiefly to the distance between the viewpoint and the Development, which means that the Development would appear as a small scale and distant feature, occupying a very limited extent in a much broader view. Variances in scale with Operational Corkey Windfarm and operational Gruig Windfarm would be apparent but not notable from this range and seen in a context where variances in scale of turbines is a baseline feature of the view.

6.8.19 Effects on Principal Visual Receptors

521. The second part of the assessment of effects on views is the assessment of effects on principal visual receptors. The principal visual receptors considered in the assessment include settlements and route corridors (including roads, railways, and national cycle routes). These are shown on **Figure 6.5**, and in conjunction with the ZTV on **Figure 6.10**. The selection of the principal visual receptors for detailed assessment is as described in the baseline section of this chapter. This highlighted that of the principal visual receptors two settlements, two roads and one long distance footpath may be significantly affected by the Development and should be assessed in detail as follows:

- Clough Mills;
- Dunloy;
- A26:
- B94; and
- Moyle Way Long Distance Route.

522. The effects on residents in these settlement, road-users on these roads and walkers on this path are described below. The other principal visual receptors were discounted as they were considered to not have the potential to be significantly affected.

523. The settlements considered in this assessment are drawn from the Settlement Development Limits (SDLs) dataset as provided by the Northern Ireland Statistics and Research Agency (NISRA). SDL boundaries are available for settlements with a population of greater than 1,000; therefore, the settlements included in this assessment are those that have a population of over 1,000 people. This approach was agreed thought the Scoping process.

6.8.20 Clough Mills

524. Clough Mills is a village, located approximately 5 km to the south-west of the Development. It sits on Cloughmills Water just east of where it joins the River Main, such that its position is lower in elevation than the surrounding gently undulating landform. The B94 is the main road through the village, from which a series of cul-de-sacs and smaller streets are accessed. The village is surrounded by farmland comprising mostly small to medium fields of improved pasture. Operational Corkey Windfarm and Gruig Windfarm are visible on Slievenahanaghan Hill in glimpsed views from more elevated parts of the village.

525. Viewpoint 8 is representative of residents in Clough Mills as well as road-users on the B94 in instances where views are gained. The assessment of this viewpoint in **Section 6.8.8** rates the sensitivity as medium, the magnitude of change during construction as medium and during operation as medium to low, and the effect during both phases as not significant.

6.8.20.1 Sensitivity

526. The value of the views of residents in Clough Mills is medium. The village and the surrounding landscape are not covered by any local or national designations which would otherwise denote a special scenic or historic value. The village has been developed with buildings facing in towards streets and has no particular association with surrounding landform features such as Slievenahanaghan Hill.

527. The susceptibility of residents in the village to the effects of the Development would be medium. The village comprises mostly traditional streets with buildings facing inwards. Views from properties and streets are therefore mostly contained by surrounding built form, with the exception of properties on the settlement boundary. Residents on the eastern boundary would be most susceptible as this side of the village is generally open towards the Development, although the rising landform and occasional vegetation on this side of the town, would reduce the susceptibility and this prevents it from being rated high.

528. The overall sensitivity of residents at Clough Mills to the effects of the Development would be **medium**.

6.8.20.2 Magnitude of change

529. The ZTV in **Figure 6.10** shows almost continuous theoretical visibility to occur across the village, with the exception of the eastern boundary where there are some small patches of no visibility. While this eastern boundary would potentially be the most susceptible to the effects of the Development, gently undulating landform and vegetation would reduce actual visibility. Across the majority of the village, visibility would be screened by the enclosed nature of the urban form, with occasional glimpsed views occurring.

530. From those areas of actual visibility, all five Development turbines would be theoretically visible set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen evenly spaced and of relatively even elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. While no direct scale comparison would be possible, as the 57 m tall Wind Turbines would be removed prior to the 137 m Wind Turbines being erected, a perceived increase would be based on people's recollection of the difference in the comparative scale of these Wind Turbines and the features of the landscape in the views. The Development would be seen at a distance of approximately 5 to 6 km. It would be seen to the left of operational Gruig Windfarm and this would keep this this type of influence contained within this upland area. Despite their proximity, they would be seen as separate developments owing to the small separation gap and the variance in scale.

531. During the decommissioning of Operational Corkey Windfarm the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this village, and while the main track leading onto the hill would potentially be apparent, this forms a baseline feature. The magnitude of change during these initial phases would be **medium** from those localised areas where visibility would occur and **no effect** from where there would be no visibility. While the tall cranes, decommissioning and construction of turbines would form a notable feature on this locally prominent hill, the separation distance combined with the extent of enclosure within the surrounding area would moderate the effect.

532. During operation, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of residents in Clough Mills area during operation;

- The separation distance of 5 to 6 km would mean that the Development turbines where visible would present a feature on this locally prominent hill;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m);
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines, albeit in a context where variance in turbine scale is readily evident; and
- The effect of the Development in conjunction with Gruig Windfarm would increase the vertical influence of windfarm development from this sector of the view.

533. The following factors would moderate the magnitude of change on the views of residents in Clough Mills during operation;

- The limited extent of Clough Mills from which the Development would be readily visible;
- The existing presence of Operational Corkey Windfarm would mean that the Development would be constructed on a Site where windfarm development is an established baseline feature;
- The proximity of the Development to Gruig Windfarm would help to contain the extent of influence from this type of development within the same upland area;
- The small number of Development turbines means they would form a relatively compact group with a reduced horizontal extent and avoid spreading this influence into neighbouring landforms or different sectors of the view;
- Slievenahanaghan Hill, with which the Development would be associated, appears as a background feature in the view, with the surrounding agricultural landscape having a more immediate influence on the character of view; and
- The turbines would appear evenly spaced and form a tidy composition that appears appropriate in this upland landscape.

534. Taking all these factors into account, the magnitude of change on the views of residents in Clough Mills as a result of the Development during operation would be **medium**, in those localised parts from where visibility would occur and **no effect** where there would be no clear views in the direction of the Development.

6.8.20.3 Significance of Effect

535. The effect of the Development on the views of residents in Clough Mills would be **not significant** during the decommissioning of Operational Corkey Windfarm and the construction and operational phases of the Development. This finding relates chiefly to the limited extent of Clough Mills from which the Development would be readily visible and the existing influence that windfarm development has on view from the village. Despite the increase in scale of the Development turbines, the separation distance combined with the influence of the wider view would moderate the overall effect.

6.8.21 Dunloy

536. Dunloy is a small village, located approximately 9 km to the west of the Development. It sits on the eastern flank of Long Mountain to the west of the valley of the River Main, such that it occupies an elevated position across the valley of the River Main to the east. The B16 is the main street through the village, onto which Tullaghans Road and Bridge Road converge and from which a series of cul-de-sacs and smaller streets are accessed. The village is surrounded by farmland comprising mostly small to medium fields of improved pasture. Operational Corkey Windfarm and Gruig Windfarm are visible on Slievenahanaghan Hill on the eastern side of the valley, albeit seen as relatively small scale and distant features.

537. Viewpoint 10 is representative of residents in Dunloy as well as north and south-bound road-users on the B16 in instances where views are gained. The assessment of this viewpoint in **Section 6.8.10** rates the sensitivity as medium, the magnitude of change during construction and during operation as medium to low, and the effect during both phases as not significant.

6.8.21.1 Sensitivity

538. The value of views of residents in Dunloy is medium. The village and the surrounding landscape are not covered by any local or national designations which would otherwise denote a special scenic or historic value. The village has been developed with buildings facing in towards streets and has no particular association with surrounding landform features, such as Slievenahanaghan Hill.

539. The susceptibility of residents in the village to the effects of the Development would be medium. The village comprises mostly traditional streets with buildings facing inwards, in a location which lies low within the surrounding landscape. Views from properties and streets are therefore mostly contained by surrounding built form, with the exception of properties on the settlement boundary. Residents on the eastern boundary would be most susceptible as this side of the village is generally open towards the Development, albeit with enclosure from some vegetation and undulating landform.

540. The overall sensitivity of residents at Dunloy to the effects of the Development would be **medium**.

6.8.21.2 Magnitude of change

541. The ZTV in **Figure 6.10** shows continuous theoretical visibility to occur across the full extent of the town. In reality, views from the village would mostly be screened by the enclosure of the urban form. Glimpsed views would occur between the buildings, and from the more elevated parts of the village to the west, while more apparent views may occur from some properties along the eastern boundary, which faces towards the Development. While this eastern boundary would potentially be the most susceptible to the effects of the Development, intervening vegetation would reduce actual visibility.

542. The Development turbines would be seen set on or behind the ridgeline of Slievenahanaghan Hill. They would be seen fairly evenly spaced and relatively even in elevation. They would replace the Operational Corkey Windfarm turbines, increasing the height from 57 m to 137 m to blade tip and reducing the number of turbines from ten to five. Although no direct scale comparison would be possible, as the 57 m tall Wind Turbines would be removed prior to the 137 m Wind Turbines being erected, a perceived increase would be based on people's recollection of the difference in the comparative scale of these Wind Turbines and the features of the landscape in the views. The closest Development turbine would be seen at a distance of approximately 9 km and the Development wold occupy a small proportion of the much wider view available across the valley. Operational Gruig Windfarm is visible in the trough to the right of the Development, operational Altaveedan Windfarm is visible on the fringe of the valley further to the left and domestic turbines are visible intermittently throughout the valley landscape.

543. During the decommissioning of Operational Corkey Windfarm the main features that would affect views from Dunloy would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature, while the access tracks may also be visible. Other infrastructure, such as the construction compound and control building would not be readily apparent from this distance, owing to their comparatively small scale. The magnitude of change during the combined decommissioning and construction stage would be **medium to low** in those localised parts where visibility would occur and no effect where there would be no visibility. This finding relates chiefly to the separation distance between residents in Dunloy and the Development, which would ensure the cranes and turbines would form distant features.

544. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of residents in Dunloy during operation;

- All five of the Development turbines would be readily visible set along the ridgeline of the Antrim Hills, albeit occupying a small proportion of a much wider skyline;
- The Antrim Hills form an enclosing ridgeline from this western side of the valley and the association of the Development with this distinctive landform feature raises its prominence in views from this area;
- The natural draw of the views of residents and road-users eastwards across the valley towards the Antrim Hills would increase the influence of the Development; and
- The Development turbines would add to the existing influence of Gruig Windfarm and the scale comparison between the turbines would accentuate the larger scale of the Development turbines, with them also appearing in front of the Gruig turbines.

545. The following factors would moderate the magnitude of change on the views of residents in Dunloy during operation;

- The limited extent of the village from which visibility of the Development would occur;
- The separation distance of approximately 9 to 10 km from the village means that the Development would appear as a relatively small and distant feature, occupying a small proportion of the wider view and the larger scale of the Development turbines would not be so readily evident;
- The Development turbines would be seen in the context of the maximum height of Slievenahanaghan Hill and this would produce less of a scale comparison with the hill, that would moderate the perceived scale of the Development turbines;

- The extent of the intervening valley landscape would emphasise the separation between Dunloy and the Development and reduce its influence on residents;
- The small number of Development turbines means they would form a relatively compact group with limited horizontal extent and avoid spreading this influence into neighbouring landforms or different sectors of the view;
- The replacement of the Operational Corkey Windfarm turbines with the Development turbines on the same Site would ensure that the Development would not be introducing a new influence; and
- The Development turbines would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view.

546. Taking all these factors into account, the magnitude of change on the views of residents in Dunloy as a result of the Development during operation would be **medium to low** in those localised parts from where visibility would occur and **no effect** where there would be no visibility.

6.8.21.3 Significance of Effect

547. The effect of the Development on the views of residents in Dunloy would be **not significant** during the decommissioning of Operational Corkey Windfarm and the construction and operational phases of the Development. The Development would appear as a relatively small scale and distant feature, occupying a small proportion of the wider view, and although the increase in the scale of the turbines would be apparent, it would not redefine the character of the view.

6.8.22 A26

548. The A26 is the main north to south road between Ballymena and Coleraine, and forms part of the wider link to Belfast City. Traffic flows on the A26 are typically heavy and traffic speeds are typically fast. The ZTV in **Figure 6.10** shows theoretical visibility to be almost continuous within the 15 km radius Study Area, where the A26 extends from Ballymena in the south to Ballymoney in the north-east. Actual visibility is greatly reduced by the combination of localised vegetation and landform, in particular cutting along long sections of the road.

549. The section of the A26 between Ballymena and Ballymoney does not pass through any settlements and the views of road-users are characterised by the combination of the A26 and the rural valley landscape of the River Main. The A26 comprises dual carriageway along much of its length, with bridges over and slip roads on and off. This highly engineered road system appears at variance with the small-scale and rural character of the surrounding landscape. While some built form is visible to road-users, this is typically small in scale and rural in character.

550. Beyond the localised influence of this busy road, the character of the surrounding landscape is defined primarily by the agricultural land-use. Views of the valley landscape from the A26 are largely contained owing to the combination of its relatively low-lying route and the intervening landform and vegetation, both within the fore and middle ground ranges. Despite the limited extent to which the valley is visible, the ridgelines which enclose the valley to the east and the west are visible intermittently and present a contrasting upland character, with Operational Corkey Windfarm and Gruig Windfarm located on the ridgeline of Slievenahanaghan Hill to the east and Long Mountain, Glenbuck I and II, and Garves on the ridgeline to the west.

6.8.22.1 Sensitivity

551. The value of the views of road-users on the A26 is medium. The road and the surrounding landscape are not covered by any national or regional landscape designations and there are no formal viewpoints along the A26; these factors denoting the absence of any recognised or formal value to the views of road-users or the content of their views. Furthermore, the presence of the busy A26, overbridges, signage, crash barriers and lighting detract from the rural value of this area. There is, however, a local value associated with the visual amenity of road-users, and this establishes a medium rating.

552. The susceptibility of road-users on the A26 would be medium to low. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be intermittently visible from short sections of the A26 where open aspects towards the Site occur. The susceptibility would, however, be moderated by the separation distance and the existing influence of Operational Corkey Windfarm and operational Gruig Windfarm in these views.

553. The combination of the value of the views and the susceptibility of road-users, would give rise to an overall **medium** sensitivity.

6.8.22.2 Magnitude of Change

554. The ZTV in **Figure 6.10** shows theoretical visibility to be almost continuous within the 15 km radius Study Area, where the A26 extends from Ballymena in the south to Ballymoney in the north-east. Actual visibility is greatly reduced by the combination of localised landform, in particular cutting along long sections of the road and roadside vegetation. The minimum distance between the A26 and the Development would be approximately 6.5 km and this distance, combined with the intermittent extent to which the Development would be visible, the high speed at which road-users would typically be travelling and the typically oblique to perpendicular angle of their views.

555. During the decommissioning of Operational Corkey Windfarm, the main features that would affect views would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. Similarly, during construction, the tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this visual receptor. The magnitude of change during the decommissioning and construction phases would be **medium to low**. This finding relates chiefly to the distance between the A26 and the Development, the limited extent to which the Development would be visible and the baseline influence from the operational windfarms in this location.

556. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of road-users on the A26 between Ballymena and Ballymoney during operation;

- The range of the Development at a minimum of approximately 6.5 km would mean that the Development turbines would present a visible feature on this locally prominent hill;
- The Development would be associated with the elevated ridgeline of the Slievenahanaghan Hill which is intermittently visible from the low-lying valley location of the A26;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m); and
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines, albeit seen in a context where variance in the scale of turbines is a baseline feature.

557. The following factors would moderate the magnitude of change on the views of road-users on the A26 between Ballymena and Ballymoney during operation;

- The effect on the A26 would be limited by the intervening landform and vegetation, the notable separation distances and the oblique nature of the views, especially form the closer range central section;
- The baseline presence of Operational Corkey Windfarm and Gruig Windfarm would mean that the Development would be constructed in an upland area where windfarm development is an established baseline feature;
- The small number of Development turbines means they would form a relatively compact group with a reduced horizontal extent and occupying a small proportion of a much wider view;
- The background role of Slievenahanaghan Hill, within the wider view would reduce the prominence of the Development on this section of the A26 road and the adjacent farmland will have a more immediate influence on the character of the views; and
- The Development turbines would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view.

558. Taking all these factors into account, the magnitude of change on the views of road-users as a result of the operation of the Development would be **medium to low** in those localised parts from where visibility would occur and **no effect** where there would be no visibility.

6.8.22.3 Significance of Effect

559. The effects of the Development on the views of road-users on the A26 would be **not significant** during the decommissioning of Operational Corkey Windfarm and the construction and operation of the Development. This finding relates chiefly to the intermittent extent of visibility north-bound road-users would experience from the A26, the separation distance of the Development from the road, which would mean the larger scale of the Development turbines would not be so readily apparent,

the oblique to perpendicular angle of their views, the small extent of the wider view the Development would occupy and the baseline influence of the operational windfarms on Slievenahanaghan Hill.

6.8.23 B94

560. The B94 is a minor road that connects Broughshane to the east of Ballymena, with the A26 to the west of Clough Mills, passing through the village of Clogh on route. While the B94 is a much smaller, slower and quieter road than the A26, it is well used by local road-users and forms a useful connection onto and off the A26. It sits within the south-west sector of the Study Area with the closest section occurring at Clough Mills where it comes within approximately 6 km of the Development. The Development would be more apparent to road-users travelling north-east than south-west although the Development would be seen at an oblique angle to the north-east.

561. The B94 passes across the eastern side of the River Main valley, which is characterised by the improved and semi-improved pasture, laid out in small and medium fields with enclosure from either stone walls, hedgerows or fences. Development comprises mostly rural farmsteads and dwellings, with occasional small villages. Operational Rathsherry and Elginny Hill are located to the east of the section of the B94 between Broughshane and Rathkenny. Operational Corkey Windfarm and Gruig Windfarm are located to the north-east of Clough Mills and establish this type of development as a baseline feature of Slievenahanaghan Hill. Across the valley slopes, surrounding the B94, the undulations of the land are more pronounced than across the valley floor and this variable landform affects the extent of visibility experienced by road-users, with higher landform containing views and lower landform allowing them to open. Where vegetation occurs, views are often further enclosed.

6.8.23.1 Sensitivity

562. The value of the views of road-users on the B94 is medium. The viewpoint and the view are not covered by any national or regional landscape designations and there are no formal viewpoints along the B94; these factors denoting the absence of any recognised or formal value to the views of road-users or the content of their views. There is, however, a local value associated with the visual amenity of road-users, and this establishes a medium rating.

563. The susceptibility of road-users on the B94 would be medium. The Development would be seen to occupy the summit of Slievenahanaghan Hill and this would be intermittently visible from sections of the B94 between Clogh and the A26, where open aspects towards the Site occur. The susceptibility would, however, be moderated by the separation distance and the existing influence of Operational Corkey Windfarm and operational Gruig Windfarm in these views.

564. The combination of the value of the view and the susceptibility of road-users, would give rise to an overall **medium** sensitivity.

6.8.23.2 Magnitude of Change

565. The ZTV in **Figure 6.10** shows theoretical visibility to be almost continuous within the 15 km radius Study Area, where the A26 extends from Ballymena in the south to Ballymoney in the north-east. The minimum distance between the B94 and the Development would be approximately 6 km and the section over which the views of road-users would be most likely to be affected occurs between Clough Mills and Clogh, at approximately 7.5 km. While actual visibility would be partly reduced by the combination of localised landform and roadside vegetation, for some sections, views north-east towards the Site would be apparent. Currently, Operational Corkey Windfarm and Gruig Windfarm form visible features on the upland ridgeline, albeit not prominent owing to their distance combined with their comparatively smaller scale. The Development would form a more prominent feature owing to its increased vertical scale, although the horizontal scale would marginally decrease, and with the same separation distance and in the context of the same baseline influences, it not become the defining feature of the views.

566. During the decommissioning of Operational Corkey Windfarm, the main features that would affect views from this 7.5 km section of the B94 would be the presence and movement of tall cranes on Site and the decommissioning and removal of turbine parts. The tall cranes and the emerging Development turbines would form the main feature. Other infrastructure, such as the construction compound, control building and access tracks would not be readily visible from this visual receptor. The magnitude of change during the initial decommissioning and construction phases would be **medium to low**. This finding relates chiefly to the distance between the B94 and the Development, the intermittent extent to which the Development would be visible and the baseline influence from the operational windfarms in this location.

567. During the operational stage, the effects would relate principally to the presence of the Development turbines. The following factors would add to the magnitude of change on the views of road-users on the B94;

- Despite the undulating nature of the landform to the north-east of the B94, the Development would be associated with the elevated ridgeline of the Slievenahanaghan Hill which is intermittently visible from the B94;
- Although no direct scale comparison would occur, the Wind Turbines of the Development would be perceived to have a notably larger scale than the Wind Turbines of Operational Corkey Windfarm which would have been removed (137m as opposed to 57m); and
- The scale of the Development turbines in relation to the scale of the operational Gruig turbines would accentuate the larger scale of the Development turbines, albeit seen in a context where variance in the scale of turbines is a baseline feature.

568. The following factors would moderate the magnitude of change on the views of east-bound road-users on the B94 overbridge during operation;

- The effect on this 7.5 km section of the B94 would be limited by the intervening landform and vegetation, the notable separation distances and the oblique nature of the views;
- The baseline presence of Operational Corkey Windfarm and Gruig Windfarm would mean that the Development would be constructed in an upland area where windfarm development is an established baseline feature;
- The small number of Development turbines means they would form a relatively compact group with reduced horizontal extent and occupying a small proportion of the wider view;
- The background role of Slievenahanaghan Hill, within the wider view would reduce the prominence of the Development with the undulating farmland having a more immediate influence on the character of the views; and
- The Development turbines would appear contained on the ridgeline of Slievenahanaghan Hill and avoid spreading this influence into neighbouring landforms or different sectors of the view.

569. Taking all these factors into account, the magnitude of change on the views of road-users as a result of the operation of the Development would be **medium to low** in those localised parts from where visibility would occur and **no effect** where there would be no visibility.

6.8.23.3 Significance of Effect

570. The effects of the Development on the views of road-users on the B94 would be **not significant** during the decommissioning of Operational Corkey Windfarm and the construction and operational phases of the Development. This finding relates chiefly to the intermittent extent of visibility road-users would experience from the B94, the small proportion of the wider views the Development would occupy, the separation distance of the Development from the road, which would mean the larger scale of the Development turbines would not be so readily apparent, and the baseline influence of the operational windfarms on Slievenahanaghan Hill.

6.8.24 Moyle Way Long Distance Footpath

571. Ulster Way is a long distance footpath, covering 1,070 km and taking in all six of Northern Ireland's Counties. The Moyle Way forms the section of the Ulster Way that connects Ballycastle on the northern coast, with Waterfoot on the eastern coast, covering a distance of 42 km and passing through the Antrim Glens and Hills on the way. The section of the route that lies closest to the Development, is situated between Slieveanorra and Trostan, with a separation distance of approximately 4 to 6.5 km from the Development. It comprises a continuous route with sign-posted paths that lead through the afforested and open moorland areas of this upland landscape. While the upper slopes and summits of Slieveanorra and Trostan comprise open moorland, part of the section between is enclosed by commercial forestry.

572. Slieveanorra (508 m AOD) and Trostan (550 m AOD) form high points along the Moyle Way and it is a popular section with walkers owing to the panoramic views available from the summits. The views from the summit of Slieveanorra and Trostan are expansive in all directions, with views extending towards the Sperrins to the west, the Western Isles of Scotland to the north-east, Rathlin Island to the north and Slemish to the south. The Antrim Hills characterise the surrounding landscape with their gentle undulations and well-rounded summits, which merge collectively into long and low ridgelines. While most of the upland summits are retained as open moorland, the broad and expansive Slieveanorra Forest blankets most of the surrounding hill slopes. This land cover does not appear natural owing to the single species, single age, geometric edges and breaks, and blocks of clear-felling. Furthermore, the presence of the access track and the masts on the summit detract from any sense of remoteness or wildness that might otherwise have arisen within this upland landscape.

573. The view towards the Site from this section of the Moyle Way is characterised by the distinctive ridgeline between Gruig Hill and Slievenahanaghan Hill. Here open moorland is evident in the mottled brown landcover and the ridgeline is marked by a

series of ten turbines belonging to Operational Corkey Windfarm. To the left lies operational Gruig Windfarm, set in a trough below the ridgeline such that the larger scale of the turbines compared to the Operational Corkey Windfarm turbines is not readily evident. With the lower-lying valley landscapes visible further west, this hill ridge forms a clear definition to the western extent of the Antrim Hills.

6.8.24.1 Sensitivity

574. The value of the Moyle Way is medium to high. This route is publicly accessible and its status as a long distance path adds to its value. The Moyle Way passes through the western side of the national landscape designation of the Antrim Coast and Glens AONB. While this formal recognition of the scenic value raises the value of the views of walkers, through the Antrim Glens and Hills, the extent of modification relating to commercial forestry and the influence of human interventions such as masts and operational windfarms, prevents this value from being rated high.

575. The susceptibility of walkers on the Moyle Way would be medium. From the majority of the route, there would be no visibility of the Development as shown on the ZTV in **Figure 6.10**. From the approximate 6 km section of the route between Slieveanorra and Trostan, the Development would be intermittently visible. The Development would occupy only a small proportion of this south-west sector of the view and a much smaller proportion of the panoramic view. Furthermore, the south-west sector is one of the less remarkable sectors in terms of scenic interest, although the Slievenahanaghan Hill ridge does form a distinctive landform feature. The susceptibility is also prevented from being rated high by the existing influence of windfarm development on Slievenahanaghan Hill. This means that the Development would not be introducing a new type of development, but instead replace and increase the vertical scale of an existing type of development.

576. The combination of the value of the view and the susceptibility of walkers on the Moyle Way gives rise to an overall **medium to high** sensitivity.

6.8.24.2 Magnitude of Change

577. The ZTV in **Figure 6.10** shows that all five Development turbines would be visible in three distinct sections; to the south of the summit of Slieveanorra, to the west of the summit of Trostan, and in an intermediate section through Slieveanorra Forest, with the closest located 4.87 km from the viewpoint. Where there is visibility from Slieveanorra and Trostan it would comprise all five turbines seen set on the ridgeline of Slievenahanaghan Hill, albeit with visibility being at its fullest from the summits and then reducing with the fall in elevation. The Development turbines where visible, would be seen to the right of the operational Gruig Windfarm turbines, which would be seen in the trough below the hill. In comparison to Operational Corkey Windfarm, the Development would occupy similar horizontal extents, albeit shifted slightly to the right, but owing to the larger turbines would notably increase the vertical scale.

578. Slievenahanaghan Hill would form a screen to much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and construction of the Development, such as the construction compound, control building and extension of access tracks. The most apparent features during these phases would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. These would give rise to a **medium** magnitude of change as they would be visible along this prominent ridgeline and appear at variance with the character of this upland landscape.

579. During operation, it would be the presence of the Development turbines and the movement of their blades that that would form the main feature. The following criteria would add to the magnitude of change on the views of walkers between Slieveanorra and Trostan on the Moyle Way, during operation;

- The distance of approximately 4 to 7 km to the nearest turbine and the location of the Development on the hilltop would make it a readily apparent feature in the views of walkers over the sections of the Moyle Way where visibility would be gained;
- Despite the proximity of the Development to Gruig Windfarm, the variance in scale would ensure these two windfarms would be seen as separate developments and the lack of continuity would accentuate the prominence of the Development, albeit seen in a context where variance in turbine scale is readily evident;
- The Development turbines would appear large in scale in relation to the scale of the hills, and in relation to the smaller scale of the operational Gruig turbines where visibility is gained; and
- The Development turbines would appear prominent owing to their location along the ridgeline.

580. The following criteria would moderate the magnitude of change on the views of walkers between Slieveanorra and Trostan on the Moyle Way, during operation;

- The Development would be associated with, and contained within, the upland landscape, which is established in the baseline view as a location for windfarm development;
- The small number of turbines and their compact horizontal extent would mean they would appear contained on Slievenahanaghan Hill and occupy only a small proportion of the wider views of walkers;
- The presence of the masts, forestry and access tracks would moderate the effects of the Development by presenting a context in which the landscape has already been modified by human interventions;
- The Development would be seen on the western edge of the Antrim Hills and in the least remarkable sector of the view; and
- The separation distance between the Development and Moyle Way and the location of the Development on a ridgeline separated by an intervening valley and forest would ensure the Development would be seen as a contained feature within a wider landscape setting.

581. Taking all these factors into account, the overall magnitude of change on the views of walkers on Moyle Way during operation would be **medium** across the localised 1.3 km section to the south of Slieveanorra summit and the 1.5 km section to the west of Trostan summit and **no effect** where there would be no visibility across the majority of the route.

6.8.24.3 Significance of Effect

582. The effect of the Development on the views of walkers on Slieveanorra would be **significant** during initial decommissioning of Operational Corkey Windfarm and construction and operational phases of the Development across the 1.3 km section to the south of Slieveanorra summit and the 1.5 km section to the west of Trostan summit. The effect on all other sections of the 42 km route would be **not significant**. This finding relates chiefly to the existing influence that windfarm development already has in this sector of the view and despite the increase in the vertical scale of the Development turbines, the separation distance combined with the extensive influence of the wider view would moderate the overall effect.

6.8.25 Summary of Visual Effects

583. The assessment of the effects of the Development has found that significant effects would occur during the initial decommissioning, construction and operational phases at ten of the 18 viewpoints and from one of the five visual receptors, which were identified as having potential to undergo significant effects.

584. The viewpoints all lie within 12 km of the Development with the exception of Viewpoint 15 Slemish, which is at an approximate distance of 20 km. This shows that the viewpoints are all representative of close to middle range views and the reason why this has arisen relates to a combination of the following factors. The shape and alignment of the landform, with upland ridges running north-east to south-west contains the extent of visibility to the east, most notably, but also the west. The ZTV in **Figure 6.9** shows how the ridgeline through Slieveanorra to the east, limits the extent of theoretical visibility across the wider extent of the Antrim Hills and Glens, and how the ridgeline through Long Mountain to the west, limits the extent of theoretical visibility further west. While theoretical visibility is shown in the ZTV to extend to the north and south, receptors either on the lower parts of the ridge or beyond the ridge do not have a strong association with Slievenahanaghan Hill where the Site is located and this reduces the potential for a significant effect to arise. There is a limited extent of theoretical visibility beyond 12 km as shown on the ZTV and the even more limited actual visibility owing to localised landform, vegetation and built form, as realised during site work throughout the Study Area. Furthermore, the baseline influence of windfarm development on the Site combined with a fewer number of turbines being proposed, retaining the Development within the horizontal extent of the Operational Corkey Windfarm, despite their larger vertical scale, reduces the potential for significant effects to arise across the middle to distant ranges of the Study Area.

585. Seven of the viewpoints which would undergo significant effects are representative of rural settlement and rural roads; namely, Corkey, Lislaban, Loughgiel, Ballyweeny, Kilmandil, Reservoir Road and Altnahinch. Of the remaining three, two are representative of a rural road, Altnahinch Road south and central, and Altnahinch Reservoir, and one is representative of the rural footpath over Slieveanorra, which also ties in with the significant effect on a short section of the visual receptor of the Moyle Way. All these viewpoints and the visual receptors they represent are located approximately 5 km of the Development, making all the visual effects localised. The significant effects on visual receptors extend across the valley landscape to the west out to a range of approximately 5 km and approximately 4 km to the north-east and south-west. To the east, visibility is largely precluded by the extent of commercial forestry, albeit with effects extending north, north-east and east, out to range of approximately 5 km and to the south-east and south to a range of approximately 4 km.

6.9 Summary of Effects

586. The potential effects on the landscape and visual receptors that would arise as a result of the Development have been assessed in this chapter. The process taken involved identifying those receptors with the potential to be significantly affected and assessing the potential effects that the decommissioning of Operational Corkey Windfarm and the construction and operational phases of the Development would give rise to. The significance of these effects has been assessed through combining the sensitivity of each receptor with a prediction of the magnitude of change that would occur as a result of the proposed Development. The findings of the assessment are presented in **Table 6.7**.

587. The Development comprises the decommissioning of Operational Corkey Windfarm which involves the removal of the existing ten turbines (57m to blade tip) and select associated infrastructure, and the construction of the Development, which involves the erection of the five proposed turbines (137m to blade tip) and associated infrastructure, including access tracks, control building external transformers, Energy Storage Units, substation and meteorological mast. The Development would replace Operational Corkey Windfarm on the same Site on Slievenahanaghan Hill. The Site layout is shown in **Figure 3.2** and a detailed description of the Development presented in **Chapter 3 Project Description**.

588. The Study Area for the Development covers a radius of 30 km and within this area, those receptors with the potential to receive significant effects have been assessed in detail. This has included one landscape element, four landscape character areas (LCAs), two designated landscape areas and 18 viewpoints. Photomontages have been prepared for the viewpoints, with the exception of Viewpoint 15 which lies at a range of approximately 20 km, and the figures also include a wireline of the Development on its own and a wireline with all other cumulative developments. These visualisations have helped assist in the assessment process. **Figures 6.1 to 6.22** show plans of the Study Area, landscape receptors, visual receptors and ZTVs of the Development on its own, in comparison with Operational Corkey Windfarm and in combination with other cumulative windfarms, while **Figures 6.23 to 6.40** show the photographs, wirelines and photomontages from the representative viewpoints.

Table 6.7: Summary of Effects

Receptor	Sensitivity	Construction Magnitude of Change	Construction Significance of Effect	Operation Magnitude of Change	Operation Significance of Effect
Rough Grass Moorland	medium	medium to low	not significant	medium to low	not significant
Immediate Landscape Setting: Moyle Moorlands and Forests LCA	medium to high	medium to high / medium / no effect	significant in localised parts / not significant in remaining parts	medium to high / medium / no effect	significant in localised parts / not significant in remaining parts
Local Landscape Setting: Moyle Moorlands and Forests LCA	medium to high	medium / medium to low / no effect	significant in localised parts / not significant in remaining parts	medium / medium to low / no effect	significant in localised parts / not significant in remaining parts
Local Landscape Setting: Cullybackey and Clogh Mills Drumlins	medium	medium to high / medium / medium to low / no effect	significant in localised parts / not significant in remaining parts	medium / medium to low / no effect	significant in localised parts / not significant in remaining parts
Local Landscape Setting: Central Ballymena Glens	medium	medium to high / medium / medium to low / no effect	significant in localised parts / not significant in remaining parts	medium / medium to low / no effect	not significant
Landscape Setting: Moyle Moorlands and Forests LCA	medium to high	medium to low / low / negligible / no effect	not significant	medium to low / low / negligible / no effect	not significant
Landscape Setting: Cullybackey and Clogh Mills Drumlins	medium	medium to low / low / negligible / no effect	not significant	medium to low / low / negligible / no effect	not significant
Landscape Setting: Central Ballymena Glens	medium	medium to low / low / negligible / no effect	not significant	medium to low / low / negligible / no effect	not significant
Landscape Setting: Long Mountain LCA	medium	medium to low / low / negligible / no effect	not significant	medium to low / low / negligible / no effect	not significant
Antrim Coast and Glens AONB	medium to high	medium to high / medium / medium to low / no effect	significant in localised parts / not significant in remaining parts	medium to high / medium / medium to low / no effect	significant in localised parts / not significant in remaining parts
Lissanoure Registered Garden	medium	medium to low / low / negligible / no effect	not significant	medium to low / low / negligible / no effect	not significant
Viewpoint 1: Corkey	medium to high	high	significant	medium to high	significant
Viewpoint 2: Lislaban	medium	medium to high	significant	medium to high	significant
Viewpoint 3: Reservoir Road	high	high	significant	medium to high	significant
Viewpoint 4: Loughgiel	medium to high	medium to high	significant	medium	significant
Viewpoint 5: Altnahinch Road south	medium to high	medium to high	significant	medium	significant
Viewpoint 6: Altnahinch Reservoir	medium to high	high	significant	high	significant
Viewpoint 7: Slieveanorra	medium to high	medium to high	significant	medium	significant
Viewpoint 8: Ballycregagh Road, Clough Mills	medium	medium	not significant	medium	not significant
Viewpoint 9: B94 over A26 west of Clough Mills	medium	medium	not significant	medium	not significant
Viewpoint 10: Tullaghans Road, Dunloy	medium	medium to low	not significant	medium to low	not significant
Viewpoint 11: Ballyweeny, Ballyveely Road	medium to high	medium to high	significant	medium	significant
Viewpoint 12: Altnahinch Road north	medium to high	medium to high	significant	medium to high	significant
Viewpoint 13: Cemetery near Glarryford	medium	medium to low	not significant	medium to low	not significant
Viewpoint 14: Kilmandil Road	medium to high	medium	significant	medium	significant
Viewpoint 15: Slemish	medium	medium to low	not significant	medium to low	not significant
Viewpoint 16: A26 Clough Junction	medium	medium to low	not significant	medium to low	not significant
Viewpoint 17: A26 south-east of Ballymoney	medium	medium to low	not significant	medium to low	not significant

Receptor	Sensitivity	Construction Magnitude of Change	Construction Significance of Effect	Operation Magnitude of Change	Operation Significance of Effect
Viewpoint 18: Boghill, Long Mountain	medium	medium to low	not significant	medium to low	not significant
Clough Mills	medium	medium / no effect	not significant	medium / no effect	not significant
Dunloy	medium	medium to low / no effect	not significant	medium to low / no effect	not significant
A26	medium	medium to low / no effect	not significant	medium to low / no effect	not significant
B94	medium	medium to low / no effect	not significant	medium to low / no effect	not significant
Moyle Way	medium to high	medium / medium to low / no effect	significant / not significant	medium / medium to low / no effect	Significant in localised parts / not significant for remaining parts

6.10 Statement of Significance

589. In respect of effects on landscape elements, the assessment found no significant effects would arise in relation to the loss of the rough grass moorland as a result of the decommissioning of Operational Corkey Windfarm and construction of the Development. The losses would comprise only a small proportion of a much wider landscape element and would occur in an area where operational windfarms are currently sited. Effects have been minimised by deploying a design strategy to utilise existing infrastructure associated with Operational Corkey Windfarm wherever possible. Rough grass moorland would be reinstated in those areas where infrastructure would be removed during the decommissioning of Operational Corkey Windfarm and, if decommissioning of the Development did occur at the end of its lifetime, rough grass moorland would be reinstated in those areas also, making the effect reversible.

590. In respect of effects on landscape character, the assessment found there would be significant effects within a localised 5 km radius of the Development where views are obtained. The effects on landscape character would be moderated by the existing presence of Operational Corkey Windfarm which would be replaced by the Development. Not all areas within this 5 km radius would incur signficant effects owing largely to the screening effect of landform and forestry. All LCAs beyond this radius would not incur significant effects. Parts of the following three LCAs would be significantly affected. The Moyle Moorlands and Forests LCA would be significantly affected where it occurs in the Immediate Landscape Setting of the Development (0 to 2 km) and in parts of the Local Landscape Setting (2 to 5 km); including across the Bush Valley to the north, across Slievenanee and Slieverush to the south-east and along the Slieveanorra ridgeline to the north-east, during the decommissioning of Operational Corkey Windfarm, the construction phase of the Development and the operational phase of the Development, in areas where views can be obtained . The Cullybackey and Clough Mills Drumlins LCA would be significantly affected where this LCA occurs within the Local Landscape Setting during the decommissioning of Operational Corkey Windfarm, and the construction phase of the Development, and the same area would be significantly affected during the operational phase of the Development, with the exception of the north-eastern part of the LCA. The Central Ballymena Glens would be significantly affected during the decommissioning of Operational Corkey Windfarm, and the construction phase of the Development, out to approximately 3 km of where this LCA occurs within the Local Landscape Setting but not beyond and with no significant effects occurring during the operational phase.

591. In respect of landscape designations, the assessment found that there would be significant effects in those parts of the Antrim Hills and Glens AONB, coinciding with the extent of the significant effects identified in respect of the Moyle Moorlands and Forests LCA and the Central Ballymena Glens LCA above. All other designated areas in the Study Area would remain unaffected during the decommissioning of Operational Corkey Windfarm and the construction and operational phases of the Development. This assessment includes Lissanoure Historic Garden, which despite its relatively close range, is well enclosed by mature tree cover and would, therefore, not incur a significant effect.

592. In respect of effects on visual amenity, of the 18 viewpoints assessed, the assessment found that ten of the 18 viewpoints assessed, and one of the five principal visual receptors assessed, would be subject to significant effects during the decommissioning of Operational Corkey Windfarm, the construction phase of the Development and the operational phase of the Development. These viewpoints and principal visual receptor are listed below.

- Viewpoint 1: Corkey;
- Viewpoint 2: Lislaban;
- Viewpoint 3: Reservoir Road;
- Viewpoint 4: Loughgiel;
- Viewpoint 5: Altnahinch Road south;
- Viewpoint 6: Altnahinch Reservoir;
- Viewpoint 7: Slieveanorra;
- Viewpoint 11: Ballyweeny, Ballyveely Road;
- Viewpoint 12: Altnahinch Road north;
- Viewpoint 14: Kilmandil; and
- Moyle Way long distance footpath (part of the Ulster Way).

593. The viewpoints would mostly be affected owing to their close proximity to the decommissioning of Operational Corkey Windfarm, and construction works and operation of the Development, with all viewpoints undergoing significant effects lying within 5.5 km of the Development. In the assessment of visual effects associated with windfarm developments, it is not uncommon for significant effects to extend across this extent of the Study Area. All viewpoints beyond this range would not undergo significant effects as a result of the Development.

594. The most relevant windfarms to the cumulative situation are operational and these form part of the baseline situation. The assessment of the Development in addition to the cumulative situation is, therefore, largely covered by the main assessment as this takes into account all the operational windfarms. There are a number of consented wind turbines located in the Cullybackey and Clough Mills Drumlins LCA to the west and the Central Ballymena Glens LCA to the south, which are mostly single or paired turbines. The cumulative effect of the Development in conjunction with these turbines is considered to be not significant.

595. In summary, the Development would give rise to significant effects on landscape character during the decommissioning of Operational Corkey Windfarm, and the construction and operational phases of the Development, albeit contained within the localised extent of approximately 5 km. It would give rise to significant effects on visual amenity out to approximately 5.5 km during the decommissioning of Operational Corkey Windfarm, and the construction and operational phases of the Development, in instances where views of the Development are obtained. While landscape and visual receptors beyond the 5 km and 5.5 km radii may be affected by the influence of the Development, these effects would not be significant. Furthermore, not all landscape and visual receptors within the 5 km and 5.5 km radii would incur significant effects, for example Slieveanorra Forest where no visual influence occurs. While there would be potential for cumulative effects to arise in respect of the addition of the Development to a cumulative baseline comprising the single and paired turbines in the surrounding agricultural landscapes, the assessment has found no significant cumulative effects would arise. All effects during the decommissioning of Operational Corkey Windfarm and the construction of the Development would be short term and reversible and all effects during the operation of the Development would be permanent and reversible.

6.11 Glossary

Table 6.8 Glossary of Acronyms

Acronym	
AHSV	Area of High Scenic Value
AONB	Area of Outstanding Natural Beauty
CIA	Cumulative Impact Assessment
DAERA	Department of Agriculture, Environment and Rural Affairs
DoENI	Department of the Environment Northern Ireland
ES	Environmental Statement
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
LCA	Landscape Character Area

Acronym	
LI	Landscape Institute
LVIA	Landscape and Visual Impact Assessment
NIEA	Northern Ireland Environment Agency
NILCA	Northern Ireland Landscape Character Assessment
NIRLCA	Northern Ireland Regional Landscape Character Assessment
SDL	Settlement Development Limits
SNH	Scottish Natural Heritage
SPG	Supplementary Planning Guidance
ZTV	Zone of Theoretical Visibility

7 Hydrology, Hydrogeology, Geology, Soils and Peat

7.1 Introduction

1. This Chapter of the ES evaluates the effects of the Development on the hydrology, hydrogeology, geology, soils and peat resource. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus).

2. The assessment considers the potential effects of the Development during the following phases of the Development:

- Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

3. The decommissioning of the Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these first two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

4. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

5. This Chapter of the ES is supported by the following Technical Appendices documents provided in Volume 3 of this ES:

- Technical Appendix A3.1: Outline Decommissioning/Construction Environmental Management Plan (DCEMP);
- Technical Appendix A3.2: Draft Habitat Management Plan;
- Technical Appendix A7.1: Peat Slide Risk Assessment (PSRA);
- Technical Appendix A7.2: Water Construction and Environmental Management Plan (Outline WCEMP), this will form an appendix to the Outline DCEMP however for ease of reference has been included as an appendix to this chapter for the purposes of the ES;
- Technical Appendix A7.3: Dipwell Monitoring Results; and
- Technical Appendix A7.4: Outline Peat Management Plan.

6. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Embedded Mitigation;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance;
- References; and
- Glossary.

7.2 Legislation Policy and Guidance

7. The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (the EIA Regulations)[1] establish in broad terms what is to be considered when determining the effects of development proposals on hydrology, hydrogeology, geology and peat resources. The following legislation, guidance and information sources have been considered in carrying out this assessment.

7.2.1 Legislative Background

8. The Water Framework Directive (WFD) (2000/60/EC)[2] establishes a framework for the protection, improvement and sustainable use of all water environments. It is transposed in Northern Ireland by The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017[3] and subsidiary Regulations.

9. Other relevant legislation includes:

- The Fisheries Regulations (Northern Ireland) 2014[4];
- The Private Water Supplies Regulations (Northern Ireland) 2009[5]; and
- The Water Supplies (Water Quality) (Amendment) Regulations (Northern Ireland) Regulations 2017[6].

10. A detailed assessment of land use planning legislation, policy and guidance relating to the Development can be found in **Chapter 5: Planning Policy Context** of this ES.

7.2.2 Northern Ireland Planning Policy and Guidance

11. The Strategic Planning Policy Statement for Northern Ireland (SPPS)[7] was published in 2015, and supplements the previously published Planning Policy Statements (PPS). SPPS sets out the Northern Ireland Government's policy on how nationally important land use planning matters should be addressed.

12. Annex D: *Assessing Flood Risk and Drainage Impact* of the Revised Planning Policy Statement 15 'Planning and Flood Risk' (PPS 15)[8] and The Regional Development Strategy 2035 (RDS)[9] sets out guidance for development within areas of flood risk, including the responsibilities of planning authorities in regulating and controlling development in such areas, in order to prevent increased risk of flooding in the future.

13. PPS 15 advises that (in relation to flood risk and drainage impact assessments "*…The detail of the Assessment should be proportionate to the scale and nature of the proposed development and the risks involved*" and that "*A FRA must consider the flood risk from all sources of flooding where the proposed development is located within or in proximity to the fluvial (river) flood plain*".

14. Annex D of PPS 15 also states that "*A Drainage Assessment should consider the flood risk mainly from pluvial flooding where the proposed development is located beyond the fluvial and / or coastal flood plain*".

[1] The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available online at: http://www.legislation.gov.uk/nisr/2017/83/made [Accessed 09/10/2017]
[2] European Commission, The Water Framework Directive (2000/60/EC). Available online at: http://ec.europa.eu/environment/water/water-framework/index_en.html. [Accessed on 09/10/2017]
[3] The Water Environment (Water Framework Directive) Regulations (Northern Ireland) 2017. Available online at: http://www.legislation.gov.uk/nisr/2017/81/contents/made. [Accessed on 09/10/2017]
[4] Fisheries Regulations (Northern Ireland) 2014. Available online at: http://www.legislation.gov.uk/nisr/2014/17/made . [Accessed on 09/10/2017]
[5] The Private Water Supplies Regulations (Northern Ireland) 2009. Available online at: http://www.legislation.gov.uk/nisr/2009/413/contents/made . [Accessed on 09/10/2017]
[6] The Water Supply (Water Quality) (Amendment) Regulations (Northern Ireland) 2015. Available online at: http://www.legislation.gov.uk/nisr/2017/211/contents/made. [Accessed on 14/01/2019]
[7] Strategic Planning Policy Statement for Northern Ireland 2015. Available online at: https://www.planningni.gov.uk/index/policy/spps_28_september_2015-3.pdf. [Accessed on 16/10/2017]
[8] Department of the Environment - Revised Planning Policy Statement 15 'Planning and Flood Risk' [online] Available at: http://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/pdf_-_final_revised_pps_15_-_18th_september_2014.pdf [Accessed 18/10/2017]
[9] The Regional Development Strategy 2035 (RDS) [ONLINE] Available at: https://www.planningni.gov.uk/index/policy/rds2035.pdf [Accessed 13/11/2017]

7.2.3 Guidance for Pollution Prevention (GPPs)

15. The hydrology and hydrogeology assessment of the Development will be undertaken in accordance with good practice guidance for Northern Ireland, Scotland and Wales (Guidance for Pollution Prevention (GPPs) which replace Pollution Prevention Guidelines (PPGs))[10], which includes:

- PPG1: General guide to the prevention of water pollution (July 2013);
- GPP2: Above ground oil storage tanks (January 2017);
- GPP4: Treatment and disposal of wastewater where there is no connection to the public foul sewer (October 2017);
- GPP5: Works and maintenance in or near water (January 2017);
- PPG6: Working at construction and demolition sites (2012);
- GPP8: Safe storage and disposal of used oils (July 2017);
- PPG18: Managing fire water and major spillages (June 2000);
- GPP21: Pollution incident response planning (July 2017); and
- GPP22: Dealing with spills (October 2018).

7.2.3.1 Other Guidance

16. Other relevant guidance and regulation comprises of the following:

- Planning Policy Statement (PPS) 18: Renewable Energy [11];
- The Construction Industry Research and Information Association (CIRIA) Report C689 Culvert Design and Operation Guide[12];
- CIRIA Report C532 Control of water pollution from construction sites [13];
- CIRIA Report C648 Control of water pollution from linear construction proposed developments: technical guidance[14];
- CIRIA Report C741 - Environmental Good Practice on Site Guide[15];
- CIRIA Report C753 - The SuDS Manual[16];
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments[17];
- Forest and Water, UK Forestry Standard Guidelines[18];
- UKTAG. Guidance on the Identification and Risk Assessment of Groundwater Dependent Terrestrial Ecosystems[19];
- Wind farms and groundwater impacts - A guide to EIA and Planning considerations[20];
- Best Practice Guidelines for the Irish Wind Energy Industry[21]; and
- Standing Advice Note 4 4 – Pollution Prevention Guidance[22].

7.3 Assessment Methodology and Significance Criteria

17. This assessment has involved the following elements, further details of which are provided in the sections:

- Consultation with relevant statutory and non-statutory bodies;
- Desk study, including review of available maps and published information;
- Site walkover;
- Input to design process to minimise effects;
- Identification and evaluation of potential effects;
- Evaluation of the significance of these effects;
- Identification of measures to avoid and mitigate potential effects;
- Assessment of residual effects;
- Evaluation of potential cumulative effects;
- Proposed monitoring; and
- Statement of significance.

7.3.1 Scoping Responses and Consultation

18. Information has been provided by a number of consultee organisations during the assessment, and this is summarised in **Table 7.1**. The response to each point raised by consultees is also presented within the table, demonstrating where the design of the Development has changed in response to specific issues indicated by the Northern Ireland Environment Agency (NIEA), Northern Ireland Water, Department of Agriculture, Environment and Rural Affairs (DAERA) and Causeway Coast and Glens Borough Council (CCGBC).

Table 7.1 – Consultation Responses

Consultee	Response	Response to Consultee
Northern Ireland Water	Made no comment relating to hydrology, geology or peat.	-
The Drinking Water Inspectorate	Provided information regarding Private Water Supplies.	Properties were contacted by post to ascertain the location of the supply. This information has been used to inform the design of the Development as necessary.
Department of Agriculture, Environment and Rural Affairs Northern Ireland	Water Management Unit are of the opinion that, based on the information presented, impacts on the surface water environment generated by this proposal are unlikely to be significant subject to best practice and appropriate mitigation being applied during the construction, operation and decommissioning phases. The Water Management Unit refer the applicant to NIEAs suite of advice notes. Water Management Unit request that any future application clearly demonstrate the following: - How any foul sewage (from compound) will be dealt with; - How surface water will be disposed of during the construction phase of the development; - Compliance with The Oil Storage Regulations; - Clear details of any works in, near or liable to affect a watercourse. Including the length and position of any proposed culverts; and - The application should clearly demonstrate compliance with all the relevant precepts contained in Standing Advice Note No.4 – Pollution Prevention Guidance.	Measures relating to foul sewage and surface water disposal are outlined in Section 2 of the Outline WCEMP. Construction of T5 hardstanding will require works in a watercourse: details of works and specific mitigation are outlined in Sections 7.6.1.1 and 7.6.1.3. Culvert design will be provided at the detailed design stage. Details of compliance with the Oil Storage Regulations Standing Advice Note No.4 are outlined throughout the Outline WCEMP.

[10] Netregs, 2017. Guidance for Pollution Prevention (GPPs)-Full List. Available at:: http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/. [Accessed on 22/11/2017]
[11] NI Planning Service, 2009. Planning Policy Statement 18: Renewable Energy. Available at: http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/. [Accessed on 22/11/2017]
[12] CIRIA, 2010. Report C689 Culvert Design and Operation Guide. Available for purchase at: https://www.ciria.org/CIRIA/Sign_In.aspx?WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91&returnurl=%2fResources%2fFree_publications%2fC689.aspx. [Accessed on 22/11/2017].
[13] CIRIA, 2001. ReportC532 Control of Water Pollution from Construction Sites. Available for Purchase at: https://www.ciria.org/ItemDetail?iProductCode=C532&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91. [Accessed on 22/11/2017].
[14] CIRIA, 2006. Report C648 Control of water pollution from linear construction proposed developments: technical guidance. Available for purchase at: https://www.ciria.org/Search?SearchTerms=report%20C648. [Accessed on 22/11/2017].
[15] CIRIA, 2015. Report C741 – Environmental Good Practice on Site Guide. Available for purchase at: https://www.ciria.org/Search?SearchTerms=report+C648. [Accessed on 22/11/2017].
[16] CIRIA, 2007. The SUDS Manual. Available at: https://www.ciria.org/Resources/Free_publications/SuDS_manual_C753.aspx. [Accessed on 22/11/2017].
[17] Scottish Government, 2017. Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments. Available at: http://www.gov.scot/Publications/2006/12/21162303/0. [Accessed on 22/1//2017].
[18] Forestry Commission, 2011. UK Forestry Standard. Available at: https://www.forestry.gov.uk/ukfs. [Accessed on 22/11/2017].
[19] UKTAG, 2004. Guidance on the Identification and Risk Assessment of Groundwater Dependent Terrestrial Ecosystems. Available at: https://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Risk%20assessment%20of%20terrestrial%20ecosystems%20groundwater_Draft_210104.pdf. {Accessed on 16/01/2019]
[20] DOE and NIEA. 2015. Available at: https://www.planningni.gov.uk/index/advice/northern_ireland_environment_agency_guidance/wind_farms_and_groundwater_impacts-3.pdf [Accessed on 14/01/2019].
[21] Irish Wind Energy Association, 2012. Best Practice Guidance for the Irish Wind Energy Industry. Available at: http://www.iwea.com/iweabestpracticeguidelines. [Accessed on 22/11/2017].
[22] DAERA Standing Advice, Pollution Prevention Guidance, 2017. Available at: https://www.daera-ni.gov.uk/sites/default/files/publications/daera/DAERA%20%20Standing%20Advice%20-%20WTR%20-%20Pollution%20preventing%20guidance%20-%20November%202017.pdf. [Accessed on 19/03/2019].

Consultee	Response	Response to Consultee
Geological Survey of Northern Ireland	In particular, it is noted that a large proportion of the Study Area is underlain by peat, covering high ground and moderate steep slopes. Your Environmental Impact Assessment should therefore include a full Peat Slide Hazard Risk Assessment, following the recommendations made by Scottish Nature (Scottish Nature, 2007).*	
Department for Infrastructure (DfI) – Rivers Planning Advisory Unit	DfI Rivers remit is limited to commenting on flood risk and drainage matters in accordance with planning Policy Statement 15 Planning and Flood Risk (PPS 15). Paragraph 5.8 of PPS 15 requires that flood risk and drainage assessment are addressed in the Environmental Statement.	Consideration has been given to flooding and increase in surface runoff in Sections 7.6.1.10 and 7.6.1.11 as part of the assessment of potential effects.
Causeway Coast and Glens Borough Council	Made no comment relating to hydrology, geology or peat.	

*This document is superseded by Scottish Government, 2017 Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments.

7.3.2 Scope of Assessment

7.3.2.1 Elements Scoped In to Assessment

19. The following effects on the hydrological and hydrogeological resources related to the Development will be considered within the EIA due to the potential for significant effects:

- Potential chemical pollution effects on the hydrological environment;
- Potential sedimentation as a result of the decommissioning/construction phases;
- Potential acidification of watercourses;
- Potential impediments to watercourse and near-surface water flow;
- Potential effects on private water supplies;
- Potential for an increase in run-off and flood risk;
- Potential migration of pollutants from contaminated land / previously developed areas;
- Potential compaction of superficial deposits;
- Potential for peat destabilisation;
- Potential for peat disturbance;
- Potential effects on groundwater table and flow paths from decommissioning of existing infrastructure; and
- Potential for contaminated land to be encountered during decommissioning of the existing windfarm.

20. The potential effects relating to peat that are to be considered during this assessment are:

- Potential peat slide risk;
- Potential effects relating to active peatlands as presented within **Chapter 8: Ecology and Fisheries**; and
- Potential effects relating to excavations and Management of peat and peaty soils.

21. Details of embedded mitigation and restoration relative to peatlands are described in **Technical Appendix 3.2 Draft Habitat Management Plan**.

7.3.2.2 Elements Scoped out of Assessment

22. Receptors beyond the 10 kilometres (km) Study Area will not be considered further, as beyond this distance, it is considered that developments of this nature are unlikely to have potential chemical or sedimentation effects, due to natural attenuation and dilution of potentially polluting chemicals and sediments in the water environment. This approach was set out in Section 11.2.1 the Scoping Report submitted as part of the initial decommissioning and consultation phases.

23. Bush Reservoir is hydrologically disconnected from the Site by Flisk Burn, therefore potential effects on the reservoir have been scoped out of the EIA, as detailed in **Technical Appendix 2.1 Scoping Report, Section 11.2.3**.

24. No known areas of soil contamination were identified within the Site during the site walkovers or desk studies. As no areas were identified and no effects are anticipated. Should potentially contaminated land be encountered during excavations or decommissioning, appropriate action will be taken in accordance with The Environmental Protection Act 1990 and in accordance with **Technical Appendix 3.1 Outline Decommissioning/Construction Environmental Management Plan (DCEMP)**. Potential effects arising from contaminated land have, therefore, been scoped out of this assessment.

7.3.3 Study Area

25. The hydrology and hydrogeology Study Area is based on the Site Boundary at the time of Scoping (the Study Area), and a second wider study area includes a 10 km radius from the Study Area (the Wider Study Area) in order to assess the potential effects of the Development on the wider hydrological environment. Both Study Areas are shown in **Figure 7.1**. At distances greater than 10 km within upland catchments, it is considered that schemes are unlikely to contribute to a hydrological effect, in terms of chemical or sedimentation effects, due to attenuation and dilution over distance of potentially polluting chemicals.

26. The study area for potential effects on public and private water supplies is defined as a 2 km radius of the Site Boundary at the time of Scoping. This approach was set out in **Technical Appendix 2.1 Scoping Report, Section 11.2.1** submitted as part of the consultation phase (Private Water Supply Study Area). These defined Study Areas are based on professional judgement and experience assessing similar scale developments within similar hydrological catchments.

7.3.4 Baseline Survey Methodology

7.3.4.1 Desk Study

27. The desk study included:

- Identification of underlying geology and hydrogeology;
- Collation of data provided through consultations;
- Assessment of topography and slope characteristics;
- Identification of catchments, watercourses, springs and water features;
- Collation of data provided through consultations; and
- Collation of flood plain information and water quality data.

28. Reference was also made to the following sources of information:

- The Ordnance Survey Northern Ireland (OSNI) 1:50,000 Discoverer Series (Sheet s5, 8 and 9);
- National River Flow Archive (NRFA)[23];
- Flood Maps (NI) 2017[24];
- Meteorological Office Rainfall Data[25]; and
- The Geological Survey of Northern Ireland (GSNI) Geology Map (Digital[26]).

7.3.4.2 Site Walkover

29. A site walkover was undertaken on the 30th June 2017 to verify the location and nature of watercourses and water bodies within the immediate hydrological catchment of the Development. The site walkover covered the area of the Operational Corkey Windfarm, and an area of 250 metres (m) to the south-west. Heavy precipitation fell throughout the walkover, while weather during the preceding week had been changeable.

30. Properties served by Private Water Supplies were contacted by post requesting information on the 28th August 2017. Responses were reviewed and are discussed in **Section 7.4.7.**

[23] National River Flow Archive. Available online at: https://nrfa.ceh.ac.uk/. [Accessed 09/10/2017]
[24] Flood Maps (NI). Available online at: http://riversagency.maps.arcgis.com/apps/webappviewer/index.html?id=fd6c0a01b07840269a50a2f596b3daf6. [Accessed 09/10/2017]
[25] Met Office, (current), Weather and Climate data. Available online at: https://www.metoffice.gov.uk/public/weather/climate/gcexz7nuj [Accessed 09/10/2017]
[26] Available for purchase from BGS at http://www.bgs.ac.uk/products/onshore/home.html?src=topNav [accessed 07/06/2019]

7.3.5 Methodology for the Assessment of Effects

31. The methodology outlined in the following section has been developed by Arcus in consultation with several regulatory bodies, including NIEA, DAERA, CCGBC, the Scottish Environment Protection Agency (SEPA) and the Environment Agency. As outlined in the Scoping Report, and accepted by the Council in the Scoping Opinion, the assessment is based on a source-pathway-receptor methodology, where the sensitivity of the receptors and the magnitude of potential change upon those receptors identified within the Study Areas.

7.3.5.1 Sensitivity

32. The sensitivity of the receiving environment is defined as its ability to absorb an effect without perceptible change and can be classified as high, moderate or low. These classifications are dependent on factors such as the quality of the subsurface water within the receptor, their purpose (e.g. whether used for drinking, fisheries, etc.) and existing influences, such as land-use.

33. These criteria are outlined in **Table 7.2** and are based on professional judgement and experience.

Table 7.2: Receptor Sensitivity Criteria

Receptor Sensitivity	Sensitivity Description
High	• A large, medium or small waterbody with an NIEA water quality classification of 'High' or 'Good'. • The hydrological receptor and downstream environment has limited capacity to attenuate natural fluctuations in hydrochemistry and cannot absorb further changes without fundamentally altering its baseline characteristics / natural processes. • The hydrological receptor is of high environmental importance or is designated as national or international importance, such as a Special Area of Conservation (SAC) or an Area of Special Scientific Interest (ASSI). • The receptor acts as an active floodplain or other flood defence. • The receptor is located within an active flood plain, in accordance with PPS 15 2014. • Groundwater Dependent Terrestrial Ecosystems (GWDTEs), as classified by UKTAG, which are classified as having "high groundwater dependency" have no functional impairment by man-made influence (such as drainage or forestry). • The hydrological receptor will support abstractions for public water supply or private water abstractions for more than 25 people. • Abstractions used for the production of mass produced food and drinks. • Areas containing geological or geomorphological features considered to be of national importance (e.g. geological ASSIs). • Local groundwater constitutes a valuable resource because of its high quality and yield. • Aquifer(s) of local or regional value. Statutorily designated nature conservation sites (e.g. SACs and ASSIs) dependent on groundwater. • Pristine or active peat bog habitat; evidence that peat body has an intact hydrological system or possibility that peat may not recover to pristine status.
Medium	• A large, medium or small waterbody with a NIEA water quality classification of 'Moderate'. • The hydrological receptor and downstream environment will have some capacity to attenuate natural fluctuations in hydrochemistry but cannot absorb certain changes without fundamentally altering its baseline characteristics / natural processes. • The hydrological receptor is of regional environmental importance (such as Local Nature Reserves), as defined by NIEA. • The hydrological receptor does not act as an active floodplain or other flood defence. • The hydrological receptor supports abstractions for public water supply or private water abstractions for up to 25 people. • GWDTEs which are classified as having "high groundwater dependency", as classified by UKTAG, but have functional impairment by man-made influence (such as drainage or forestry). • GWDTEs which are classified as "moderately groundwater dependent" have no functional impairment by man-made influence (such as drainage or forestry). • Areas containing geological features of designated regional importance including Regionally Important Geological/geomorphological Sites (RIGS), considered worthy of protection for their historic or aesthetic importance. • Aquifer of limited value (less than local) as water quality does not allow potable or other quality sensitive uses. Exploitation of local groundwater is not far-reaching. Local areas of nature conservation known to be sensitive to groundwater effects. • Pristine or active peat bog habitat; evidence that peat body has an intact hydrological system or possibility that peat could recover to pristine status.
Low	• A large, medium or small waterbody with a NIEA water quality classification of 'Poor' or 'Bad'. • The hydrological receptor and downstream environment will have capacity to attenuate natural fluctuations in hydrochemistry but can absorb any changes without fundamentally altering its baseline characteristics / natural processes. • The hydrological receptor is not of regional, national or international environmental importance. • The hydrological receptor is not designated for supporting freshwater ecological interest. • GWDTEs which are classified as having "low or moderate groundwater dependency", as classified by UKTAG, but have functional impairment by man-made influence (such as drainage or forestry). • The hydrological receptor does not act as an active floodplain or other flood defence. • The hydrological receptor is not used for recreational use. • The hydrological receptor does not support abstractions for public water supply or private water abstractions. • Geological features or geology not protected and not considered worthy of specific protection. • Poor groundwater quality and / or very low permeability make exploitation of groundwater unfeasible. Changes to groundwater not expected to affect local ecology. • Degraded or inactive peat; small isolated areas of peat; soil not sensitive to change, e.g. degraded / grazed; shallow, evidence of widespread erosion. Significant active land drainage has occurred resulting in ongoing dewatering of peat.

7.3.5.2 Magnitude

34. The magnitude is determined by the timing, scale, size and duration of the potential effect resulting from the Development. The magnitude of potential effects can be classified as major, moderate, minor or negligible, as outlined in **Table 7.3.**

Table 7.3: Criteria for Determining Magnitude

Magnitude of Effect	Magnitude Description
High	• A short or long term major shift in hydrochemistry or hydrological conditions sufficient to negatively change the ecology of the receptor. This change will equate to a downgrading of a NIEA water quality classification by two classes e.g. from 'High' to 'Moderate'. • A sufficient material increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS). • A major (greater than 50%) or total loss of a geological receptor or peat habitat site, or where there will be complete severance of a site such as to fundamentally affect the integrity of the site (e.g. blocking hydrological connectivity). • A major loss of (greater than 50% of study area) or total loss of highly dependent and high value GWDTE, or where there will be complete hydrological severance which will fundamentally affect the integrity of the feature. • A major permanent or long term negative change to groundwater quality or available yield. • A major permanent or long term negative change to geological receptor, such as the alteration of pH or drying out of peat.

	• Changes to groundwater quality or water table level that will negatively alter local ecology or will lead to a groundwater flooding issue.
Medium	• A short or long term non-fundamental change to the hydrochemistry or hydrological environment, resulting in a change in ecological status. This change will equate to a downgrading of a NIEA water quality classification by one class e.g. from 'High' to 'Good.' • A moderate increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS). • A loss of part (approximately 5% to 50%) of a geological receptor or peat habitat site, major severance, major effects to its integrity as a feature, or disturbance such that the value of the site will be affected, but could still function. • A loss of part (approximately 10% to 50% of study area) of a moderately dependent and moderate value GWDTE – significant hydrological severance affects the integrity of the feature, but it could still function. • Changes to the local groundwater regime that may slightly affect the use of the receptor. • The yield of existing supplies may be reduced or quality slightly deteriorated. • Fundamental negative changes to local habitats may occur, resulting in impaired functionality.
Low	• A detectable non-detrimental change to the baseline hydrochemistry or hydrological environment. This change will not result in a downgrading of the NIEA water quality classification. • A marginal increase in the probability of flooding onsite and offsite, adding to the area of land which requires protection by flood prevention measures or affecting the ability of the functional flood plain to attenuate the effects of flooding by storing flood water (in accordance with PPS). • A detectable but non-material effect on the receptor (up to 5%) or a moderate effect on its integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected. • A detectable effect on a GWDTE (loss of between 5% - 10% of study area) or a minor effect on a GWDTE's integrity as a feature or where there will be a minor severance or disturbance such that the functionality of the receptor will not be affected. • Changes to groundwater quality, levels or yields do not represent a risk to existing baseline conditions or ecology. • Small loss of soils or peatland, or where soils will be disturbed but the value not impacted. • Short-term change to baseline resource. • Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.
Negligible[27]	• No perceptible changes to the baseline hydrochemistry or hydrological environment. • No change to the NIEA water quality classification. • No increase in the probability of flooding onsite and offsite. • A slight or negligible change from baseline condition of geological resources. • Change hardly discernible, approximating to a 'no change' in geological condition. • Minimal detectable effect on a GWDTE (between to 0.1% - 5% of study area) or no discernible effect on its integrity as a feature or its functionality. • Minimal or no change to soils or peatlands • A very slight change from the baseline conditions. The change is barely distinguishable, and adopts a 'no-change' situation. • Minimal or no change to a geological site or mineral deposit.

[27]Negligible magnitude of change includes magnitude of effects that would be assessed as no change to the baseline scenario.

7.3.5.3 Significance

35. The predicted significance of the effect is determined through a standard method of assessment and based on professional judgement, considering both the sensitivity of receptor and the magnitude of the potential effect as defined in **Table 7.4**.

36. It is considered that there are no limitations to the assessment methodology used to identify potential hydrological effects arising from the Development. Baseline conditions were ascertained through a site visit.

Table 7.4: Significance Matrix

Magnitude of Effect	Sensitivity of Receptor		
	High	Medium	Low
High	Major	Major	Moderate
Medium	Major	Moderate	Minor
Low	Moderate	Minor	Negligible
Negligible	Negligible	Negligible	Negligible

37. Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations, and are shaded in light green in the above table.

7.3.6 Cumulative Assessment Methodology

38. A cumulative effect is considered to be an additional effect on hydrological resources arising from the Development in combination with other proposed developments (either under construction, consented but not built or at application stage) likely to affect the hydrological environment. At distances greater than 10 km, it is considered that schemes are unlikely to contribute to a cumulative hydrological effect due to attenuation and dilution over distance of potentially polluting chemicals, as outlined in the Scoping Report and accepted in the Scoping Opinion. Therefore, for the purposes of the assessment of potential cumulative effects on the immediate catchment and hydrological regime, only proposed developments within the Wider Study Area have been considered. These developments have been identified through consultation with the relevant local authorities and statutory consultees, and are discussed in more detail in **Section 7.8** of this Chapter.

39. The methodology followed to assess the cumulative effects is the same as that used for the Development in isolation.

7.4 Baseline Conditions

7.4.1 Topography and Land Use

40. The Site is located on the western periphery of the Antrim Hills with the low lying valley of the River Main to the west and the border range of the Antrim Hills to the east. Elevations of the Site extend from approximately 160 m AOD in the south-west to approximately 410 m AOD at the east of the Site. The Site is predominately moorland cover and is characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan.

41. Rough grazing was evident across much of the Site and the most northerly and easterly parts of the Site were occupied by the Operational Corkey Windfarm and rural upland habitat.

7.4.2 Climate

42. The National River Flow Archive (NRFA) (reports Average Annual Rainfall (AAR) at the Clough at Tullynewey gauging station, approximately 10 km south-west of the Development, reporting 1,296 millimetres (mm) (1961 – 1990). This is a typical value for the region, with the Lower Bann at Movanagher gauging station approximately 20 km west of the Development, reporting 999 mm AAR (1961 – 1990).

43. As monthly long term climate data is not freely available from the NRFA, long term average rainfall data (1981 to 2000) obtained by the Meteorological Office at the Killylane gauging station, approximately 31 km south-west of the Development, are presented in **Table 7.5**.

Table 7.5: Long term average rainfall data (1981 to 2000), Killylane gauging station.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	126.8	91.3	110.1	92.5	83.0	86.9	98.1	117.1	112.4	146.0	136.6	129.3

7.4.3 Solid Geology

44. The underlying bedrock was indicated to belong mainly to the Lower Basalt Formation comprising Paleocene aged Basalt. Within the Study Area, localised areas were recorded to belong to the Upper Basalt Formation and Interbasaltic Formations, comprising Basalt and Bauxites respectively. Shallow rock is anticipated in the upland slopes. An extract of the solid geology is shown in **Figure 7.2**.

7.4.4 Superficial Geology

45. The online GSNI[28] information indicates the majority of the Study Area to be underlain predominantly by peat with glacial till outcropping locally within the central regions and more frequently in the western areas. Peat is also prominent in the eastern face of Slievenahanaghan. An extract of the superficial geology is shown in **Figure 7.3**. This data was utilised to inform the peat assessment work within the Site.

7.4.5 Peat Investigations

46. It has been recognised that the design of the Development is likely to be influenced by the presence of peat, both as a physical consideration in terms of stability and engineering properties, and as a habitat resource. Active peatland is identified as a priority habitat in accordance with the EC Council Directive 92/43/EEC Conservation of Natural Habitats and Wild Fauna and Flora (the Habitats Directive) which is implemented by law in Northern Ireland through Article 3 of the Planning (Northern Ireland) Order 1991 and PPS18, August 2009 by Department of the Environment (DOENI)[29].

47. Initial site surveys took place at a pre-scoping stage to ascertain the extent and nature of peat within the Study Area, through a robust investigation approach suitable to the identification of active peat characteristics. Initial desk based research and co-ordination with the project ecologist defined extents of active, possibly active and not-active peat. This approach was discussed and agreed with NIEA in May 2017, the conclusions of the discussions, informed the enhanced Phase 1 peat probing and National Vegetation Classifications (NVC) survey, as discussed in **Chapter 8: Ecology and Fisheries**.

7.4.5.1 Enhanced Phase 1 Peat Investigations

48. Acknowledging the influence that peat classification will have on Development design, an enhanced Phase 1 peat depth survey has been completed. A total of 331 probes were sunk during Phase 1 works and **Figure 7.4** indicates the interpolated peat depths across the extent of survey. The Phase 1 study area was based on the initial NVC assessment to ensure the scope is aligned as closely as practicable to baseline conditions. The classification details are covered in **Chapter 8: Ecology and Fisheries.**

49. Based on the initial NVC assessment, the enhanced peat survey was undertaken as follows:

- Likely active peat areas: Probes at 50 m spacing at the boundary with possibly active peat/transition zones and further probes within the active peat zone for verification;
- Possibly active peat: 50 m peat probe and inspection grid; and
- Not active peat: 100 m peat probe and inspection grid.

50. The enhanced Phase 1 peat depth survey included a visual inspection of characteristics at or adjacent to each probe location, a photographic record, and a measurement of peat depth to 0.1 m accuracy.

51. Peat was generally thickest in the flatter topographic areas within the most eastern area of the Study Area. The peat depths in this area exceeded 1.5m in depth consistently. Peat thicknesses were lower in areas of steeper topography, with deposits recorded towards the north-west and west being in the region of 1.0 m to 1.5 m and 0 m to 0.5 m respectively.

7.4.5.2 Phase 2 Peat Investigations

52. Following the design chill a further 435 probes were undertaken over two phases, concentrated on the site layout design (which is provided in **Figure 3.2**). The spacing of probing was between 10 m and 25 m centres covering the proposed track alignments and a micro-siting corridor either side to give an indication of any changes in depths, while capturing the turbine locations and other infrastructure.

53. The findings from the Phase 2 peat probing were consistent with the phase 1 findings with the deepest peat confirmed to the flatter topographic areas of Slievenahanaghan Hill, particularly the most north easterly part of the Study Area in the vicinity of the proposed T1. Pockets of deep peat, 1.5 m or greater, were recorded across the upper regions of the hill upward of the 380 m AOD contour, with peat thinning on the steeper topographic areas. Peat was generally varying across the remainder of the Study Area with thicknesses in the region of 0.5 m or less dominating the western side. The peat depths and percentage of total probes which fall within these depths are summarised in **Table 7.6** while Interpolated Peat Depths are shown on **Figure 7.4.**

Table 7.6: Peat Depth Summary.

Peat Depth range	No. of Probes	Percentage of Total Probes (%)
0 – 0.50 m	264	34.5
0.51 m – 1.00 m	161	21.0
1.01 m – 1.50 m	135	17.6
1.51 m – 2.00 m	182	23.8
2.01 m – 3.00 m	24	3.1
Total	766	100

As part of the 'active Peat Assessment' further field surveys were carried out by NM Ecology through National Vegetation Classification and a detailed quadrat survey at select locations. The details of this survey and assessment are included in **Chapter 8: Ecology and Fisheries**.

7.4.6 Peat Stability

54. Peat instability is generally the result of a combination of causative factors. Several decommissioning and construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

55. Decommissioning and Construction activities that have the potential to increase the likelihood of peat slides include locating proposed infrastructure including track networks on sloping ground which often involves removal of surface vegetation and excavation of peat and other soils.

56. Peat varies across the proposed Study Area ranging between 0.1 m and 2.9 m. However, significantly deep areas comprising of peat in excess of 1.0 m were consistent in the area between T1 and T2 and between T1 and T5. The final layout has been developed to utilise as much of the existing windfarm infrastructure as possible with the proposed turbine locations and any new areas of infrastructure sited to avoid the deepest areas of peat.

57. A Peat Slide Risk Assessment is included in **Technical Appendix A7.1 Peat Slide Risk Assessment (PRSA)**.

7.4.7 Mining

58. A review of information available from GSNI indicated the presence of a shaft designated as a working. The shaft was situated approximately 200 m west from existing infrastructure and was named Slievenahanaghan Trial, co-ordinated at

[28] Geological Survey of Northern Ireland, Available online at: http://mapapps2.bgs.ac.uk/GSNI_Geoindex/home.html [Accessed on 23/06/2017]

[29] Department of the Environment Northern Ireland (2009) accessed at: https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/planning_policy_statement_18__renewable_energy.pdf

310677, 422413. This coordinate is at least 130m from any proposed infrastructure. Comments related to the location describes the opening type as a well and states that it is 'Antrim 18SE Field Slip - 'Trial Ore Found'. Further information was provided from GSNI stating the mine working identified is no. 444 and no specific records are held for this feature. This included the following comments:

- "*The mine is identified as an adit (horizontal entrance). This may not be visible on the landscape anymore for various reasons;*
- *The adit is associated with Iron Ore which was extensively mined within Co. Antrim;*
- *The notes record 'Trial'. This generally indicates there was no mining production but rather a test for ore and quality. Trial are generally of very limited extent;*
- *'Ore Found' may not indicate the mine was worked. This would depend on the quality of ore and extent of the material;*
- *There are no known producing abandoned mines within your area;*
- *The adit would have been driven into the hillside, this would be in easterly direction;*
- *While considered low risk, it is advisable that the mine working is further investigated to ascertain precise location, condition, extent and any potential risk it may have for development..*"

7.4.8 Hydrogeology

59. The groundwater body under the majority of the Study Area is classified by the DAERA as having 'Poor' Bedrock Overall Status. The Hydrogeological map of Northern Ireland identifies the bedrock underlying the Site as Tertiary Basalts which are locally important aquifers.

7.4.9 Surface Hydrology

60. The Development is located in the overall catchments of the Killagan Water and Cloghmills Water which are in the Neagh Bann River Basin District and the Bush River, which is located in the North Eastern River Basin District. Killagan Water bisects the Study Area in the south-west as shown in **Figure 7.5** and minor watercourses rising on the slopes to the south-west and north-west of the existing Operational Corkey Windfarm and flowing from north-east to south-west within the Study Area, connect to the Kilagan Water. Bush River is located approximately 1.2 km north-east of the Study Area boundary at its nearest point.

61. The Aghanageeragh River, which drains into Cloughmills Water is located approximately 1.1 km south-east of the Study Area. Two areas located within the Study Area drain into the catchment of Aghanageeragh River and subsequently Cloughmills Water.

62. Review of the River Basin Management Plan (RBMP) data indicates that there are three classified water bodies within the Wider Study Area, namely the Killagan Water, Cloghmills Water and the Bush River.

63. The Killagan Water is classified as having moderate overall status while the Bush River and Cloghmills Water are classified as having good overall status.

64. Bush Reservoir is located approximately 1.3 km to the north-east of the Study Area but is hydrologically disconnected from the Study Area by Flisk Burn.

65. Only three natural watercourses are present within the Study Area and these drain north-east to south-west. The watercourse and its tributaries in the west of the Study Area, approximately 1.2 km north of Moneyneagh, originates from marshy areas on the upper slopes within the Study Area. This watercourse converges with the Kilagan water in the west of the Study Area. Another minor watercourse rises in the north-east of the Study Area and flows in a south westerly direction along the north-west boundary of the Study Area converging with the Kilagan water 0.3 km west of the Study Area boundary.

66. Morphology of these watercourses is typical of upland watercourses, which are generally evenly dispersed through flat boggy ground from their upper reaches, becoming increasingly steep and faster flowing as they progress downstream to the primary rivers.

67. Baseline hydrochemistry data was obtained from the Killagan Water in proximity to Drumrankin Bridge as the watercourse exits to the west of the Study Area, by taking in-situ measurements using a hand held water quality meter. The data suggests these watercourses are typical of upland rural areas i.e. of good water quality with parameters within the expected ranges. Water quality information collected as part of the hydrological walkover has been provided for use in the Fisheries Assessment.

68. **Figure 7.5** shows the main surface watercourses and their associated catchments within the Study Area.

7.4.1 Surface Water Continuity

69. Surface watercourses within the Study Area appear to be relatively continuous and free from blockages.

7.4.2 Near-surface Water

70. Dipwells were installed by the Applicant during June 2017 in order to determine water levels in superficial deposits as part of the peat assessment. Data has been collected on 3 occasions incorporating a wet period (periods of rainfall within the previous 14 days) and a dry period (little or no rainfall within the previous 14 days). Data are detailed in **Technical Appendix A7.3 Dipwell Monitoring Results**. Dipwell locations are shown in **Figure 7.6**.

71. A number of bog water table metrics indicative of intact bog have been considered based on relevant literature and Arcus professional judgement based on experience of peatland restoration:

- The water table should not be >20 centimetres (cm);
- The water table should not be >10 cm except with the exception of sustained dry conditions; and
- The water table should normally be sustained within 5 cm of the top of the acrotelm[30].

72. Results recorded during wet periods (June 2017 and May 2018) show that areas in the north-west of the Study Area have water tables greater than 20 cm in depth, as shown in **Technical Appendix A7.3 Dipwell Monitoring Results,** suggesting that active accumulation of peat is not taking place at these locations as a result of modification.

73. Results recorded during June 2017 showed eight dipwells recorded water levels greater than 20 cm, one dipwell had water levels between 10 cm and 20 cm depth, and 20 dipwells recorded water levels between 10 cm and 0 cm depth.

74. During May 2018, three dipwells recorded depths greater than 20 cm depth. Nine dipwells recorded depths between 10 cm and 20 cm depth and 17 dipwells recorded depths of less than 10 cm.

75. Dry period results gathered during July 2018, show water levels were at their lowest with the exception of dipwells 18, 19, 20, 27 and 30 where June 2017 water levels were lower than July 2018 levels. These dipwells are located within the west and north-west of the Study Area where significant modification of the drainage regime has taken place. During July 2018 all dipwells recorded water levels below 20 cm depth.

7.4.3 Site Drainage

76. An extensive network of anthropologically made drainage ditches and peat cuttings were observed within higher ground in the southern section of the Study Area, with standing water observed within the ditches, suggesting that the peat and superficial geology in these areas is well drained.

77. Six circular concrete culverts were encountered across the Study Area where tracks associated with the Operational Corkey Wind Farm cross watercourses. Culverts appeared to be in good condition and were approximately 0.3 m in diameter.

7.4.4 Hydrological Regime and Surface Water Morphology

78. The morphology is typical of upland watercourses, which are generally evenly dispersed through flat boggy ground from their upper reaches, becoming increasingly steep and faster flowing as they progress downstream to the primary rivers.

79. Observations in the south of the Study Area indicate that morphology is relatively typical of dendritic drainage network watercourses, which are steeper in their upper reaches and become increasingly flatter as they progress down slope.

[30] Labadz et al, 2010. Peatland Hydrology. IUCN UK Peatland Programme. Available at: http://www.uplandhydrology.org.uk/wp-content/uploads/2013/12/Review-6-Peatland-Hydrology_0.pdf. [Accessed 22/11/2017].

7.4.5 Hydrological Function of Wetland Habitats

80. A Phase 1 habitat survey was undertaken to identify wetland habitats occurring within the Study Area and surrounding environment. Where wetland habitats were confirmed through Phase 1 survey, further detailed habitat assessment was undertaken, with identification of NVC communities. The survey methods employed for this assessment are outlined in **Chapter 8: Ecology and Fisheries**.

81. Blanket Bog was identified in the north-eastern section of the Study Area.

82. Blanket Bog is classified as having low dependence on groundwater in the UKTAG guidance on characterising GWDTEs and is classified as occurring more 'typically as components of ombrogenous systems'. Blanket Bog has been considered as having the potential for some groundwater dependency for the purposes of this assessment. GWDTEs are protected under Article 4 of the Water Framework Directive.

83. **Figure 8.3** shows the location of wetland habitats in relation to the Development infrastructure, as identified from the Phase 1 habitat and NVC surveys.

7.4.6 Flooding

84. Flood Maps (NI) show that the Study Area is located outside floodplains for river and coastal flooding. A minor unnamed tributary of Flisk burn, in the north-eastern section of the Study Area, is identified as floodplain within the immediate area surrounding the watercourse. As a buffer has been applied to watercourses during the design phase, no infrastructure is located within this area.

7.4.7 Public and Private Water Supplies

85. Consultation with CCGBC, Northern Ireland Water and local landowners has been undertaken to identify all public and private water supplies within this area. During consultation at the scoping stage the Drinking Water Inspectorate (DWI) identified two abstractions for private water supply within the Private Water Supply Study Area.

86. The Private Water Supplies Regulations (Northern Ireland) 2009[31] defines supplies as all water supplies intended for human consumption not provided by a water undertaker appointed under Article 13 of the 2006 Order[32].

87. Questionnaires were sent to both properties in order to determine details of the supply. A response for both properties has been received; details are outlined in **Table 7.7**.

Table 7.7 Private Water Supplies Within 2 km of the Development

Receptor	Source of Supply	With in / out Development Catchment	Distance from Development	Comment
208 Corkey Road	Spring / near surface through flow located as shown in Figure 7.5.	Within Catchment	Source of supply is approximately 500 m southwest of a temporary construction compound.	Confirmed by resident to supply 3 households.
218 Corkey Road	Spring and borehole shown in Figure 7.5	Within Catchment	Source of supply (borehole and spring) is approximately 1 km south-west of a temporary construction compound.	Confirmed by resident

88. Each water supply will be assessed to determine if any potential significant effects are likely to occur as a result of the Development.

[31] The Private Water Supplies Regulations (Northern Ireland) 2009. Available online at: http://www.legislation.gov.uk/nisr/2009/413/contents/made . [Accessed on 09/10/2017]
[32] The Water and Sewerage Services (Northern Ireland) Order 2006.

7.4.8 Designations and Fisheries

7.4.8.1 Designations

There are no statutory designations relating to water within the Study Area. There are 15 statutory designations relating to water within the Wider Study Area, identified through the use of NIEA datasets and these are presented in **Table 7.8.**

Table 7.8 Statutory Designations within the 10 km Study Area.

Designation	Distance from Study Area	Reasons for designation	Hydrologically Linked to Development?
Antrim Hills SPA	0.8 km north-east	Supporting hen harrier and merlin	No
Main Valley Bogs SAC	5.2 km west	Active raised bogs	No – within catchment however raised bogs are typically ombrogenous and not dependent on interactions with watercourses[33].
Garron Plateau SAC	8 km south-east	Blanket bog, fens, dystrophic lakes, oligotrophic lakes, wet heat and dry heath. Yellow Saxifrage, hen harrier and merlin	No
Slieveanorra and Croaghan ASSI	2.8 km north-east	Blanket bog and montane heath, Merlin and Hen Harrier	No
Dunloy Bog ASSI	5.2 km south-west	Lowland raised bog	No
Frosses Bog ASSI	6.2 km south-west	Lowland raised bog	No
Caldanagh Bog ASSI	6.5 km west	Raised bog	No
Garron Plateau ASSI	7.4 km south-east	Inland water bodies. Bogs, Marshes, Water fringed vegetation, Fens. Heath, Scrub, Maquis. Humid grassland	No
Tievebulliagh ASSI	8.1 km north-east	Tertiary Igneous Rocks	No
Glenballyemon River ASSI	8.1 km east	For flora fauna and physiographical features	No
Ballymacaldrack ASSI	8.4 km south-west	Wet grassland	No
Glenariff Glen ASSI	8.5 km north-east	Bryophyte assemblage, Higher plant assemblage	No
Rathsherry ASSI	9.5 km south	Purple moor-grass and rush pastures. Lowland meadow	No
Glenariff ASSI	9.7 km east	Mixed ashwoods	No

89. The hydrological designations are considered to be hydrologically disconnected from the Development (in terms of surface and sub-surface water effects, as development is proposed in areas that are hydrologically up-gradient) or are of sufficient distance to remain unaffected by the Development.

7.4.8.2 Fisheries

90. A fish survey was undertaken in June 2017 by Paul Johnston Associates and the report is provided as **Technical Appendix A8.4 Fisheries Assessment** to **Chapter 8: Ecology and Fisheries** of this ES.

91. The Killagan Water and Cloghmills Water are tributaries of the River Main located approximately 3.6 km south-west of the Development. The River Main is an important salmon and trout river which is one of seven Index Rivers utilised by DAERA

[33] IUCN UK Committee Peatland Programme Briefing Note No1, n.d. Available online at: http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/1-10%20Peatland%20Briefings%20-%205th%20November%202014.pdf. [Accessed on 14/03/2019].

Inland Fisheries to provide the basis for salmon management throughout Northern Ireland. In terms of salmon spawning stock the River Main has typically been below its conservation limit although the target was exceeded in 2012 and 2014. The River Main is not subject to any designations with regard to aquatic habitats or species.

92. Under the Water Framework Directive (WFD) the Killagan tributary has been assessed as of Moderate Ecological Status in each year since 2010 due to sub-standard benthic inverts and/or fish classification[34].

93. Outside of the Study Area as shown in **Figure A.8.4.3** of **Technical Appendix 8.4: Fisheries Assessment**, towards the western boundary, the Killagan water is slightly larger (1 m - 2 m wide) than the northern stream (1 m - 1.5 m) and appears to be of greater fisheries potential in this area. These streams converge approximately 0.3 km west of the Study Area boundary.

94. Bed slope and habitat quality improve towards Kilmandil Bridge (4 – 5 km from the Study Area) with improved fisheries potential over the next 3 – 3.5 km towards Killagan Bridge – trout, eel and occasional salmon are present in this area. This reach was subject to habitat enhancement works in 2006 as part of a European Economic Area (EEA) Salmon Management Project.

7.4.9 Information Gaps

95. All data considered necessary to identify and assess the potential significant effects resulting from the Development were available and used in the assessment reported in this Chapter.

7.4.10 Sensitivity of Receptors

96. The sensitivities of the identified receptors, and their relationship to the potential effects arising from the Development, are outlined in **Table 7.9.**

Table 7.9 Sensitivity of Hydrological Receptors

Receptor	Potential Effects	Sensitivity	Comment
Watercourses	Increased run-off, erosion and sedimentation, stream flow impediments and pollution as a result of decommissioning and construction groundworks and chemical handling / storage.	High	Considered High sensitivity as the Kilagan Water discharges into the River Main, which is an important salmon and trout river. The Kilagan Water is classified as having a 'moderate' overall classification.
Groundwater	Pollution as a result of erosion and sedimentation from Decommissioning/Construction activities and uncontained spills from chemical handling / storage.	High	Considered High sensitivity as hydrocarbon pollution in bedrock fissures has a lengthy attenuation period.
Near-surface water	Diversion of near-surface flows as a result of track construction and removal and the installation of turbine foundations / hardstanding.	High	Considered High sensitivity as near-surface water supplies flow to the watercourses within the Study Area, which in turn discharge into the Kilagan Water (classed as a High sensitivity receptor).
Wetland Habitat	Changes in soil and peaty soil interflow patterns	Low	Considered Low sensitivity as Blanket Bog is classified by UKTAG guidance as having low groundwater dependency.
Soils / Superficial geology (excluding peat)	Pollution as a result of track construction and chemical handling / storage.	Medium	Considered Medium sensitivity as the receptor has some capacity to filter and attenuate most potentially polluting chemicals and sediment over time.
Solid Geology (bedrock)	Loss of strata as a result of turbine excavations.	Low	Considered low sensitivity as the receptor is not designated or of limited resource across Northern Ireland and can function normally throughout all phases of the Development.
Peat	Pollution as a result of track construction and uncontained spills from chemical handling / storage. Drying out or destabilisation of peat as a result of construction activities.	High	Considered high sensitivity as the function of receptor could be permanently altered by construction activities or chemical effects. However, the receptor has some capacity to filter and attenuate most potentially polluting chemicals and sediment over time. Reinstatement / re-wetting of this receptor is possible.
Peat	Effect on active peat and carbon rich soils	High	
PWS	Pollution as a result of erosion and sedimentation from Decommissioning/Construction activities and uncontained spills from chemical handling / storage. Diversion / reduction of water supply as a result of track construction and the installation of turbine foundations / hardstanding.	Medium	Classed as Medium sensitivity as each receptor supports abstractions for private water supply of less than 25 people, in accordance with **Table 7.6** of this Chapter.

7.5 Embedded Mitigation

97. Embedded mitigation measures are set out within the Outline DCEMP (provided as **Technical Appendix A3.1**). This document is supplemented by the Water Construction and Environmental Plan (Outline WCEMP), provided as **Technical Appendix A7.2 Outline WCEMP**, which sets out specific mitigation which relates to this Development. The Outline WCEMP contains additional good practice methods that are established and effective measures focused of the hydrological environment. There is sufficient confidence in the effectiveness of the measures set out in both documents for them to be treated as part of the Development for the purposes of this assessment, and therefore embedded mitigation. The requirement of a DCEMP and its appended WCEMP, which are secured as part of a planning condition, is considered standard practice for Developments of this nature. For ease of reference throughout this Chapter, reference to specific sections in the Outline DCEMP and Outline WCEMP, which will ultimately be appended to the Outline DCEMP, are provided, detailing the appropriate embedded mitigation measures.

98. Accordingly, the identification of likely significant effects from the Development is considered following implementation of the measures in **Technical Appendix A3.1 Outline DECMP** and **Technical Appendix A7.2 Outline WCEMP**.

99. A buffer zone distance of 50 m has been established for the turbine bases and ancillary structures / infrastructure around watercourses (natural) mapped at a 1:50,000 scale at the Site as shown in **Figure 7.5**. A buffer zone distance of 20 m has

[34] NIEA River Basin View. Available online at: http://appsd.daera-ni.gov.uk/RiverBasinViewer/ [Accessed on 09/10/2017]

been applied to anthropogenic drains and smaller natural watercourses not featured on published mapping. Watercourse buffers formed a hard constraint for the Development turbine bases during the design process and have been incorporated as part of the design process. Due to geotechnical constraints on-site, T2 and T5 could not be located outside the 20 m and 50 m buffers respectively, the watercourse underneath the turbine hardstanding at T5 would either pass through a culvert below the hardstanding area or be diverted.

100. As described in **Chapter 4: Site Selection and Design,** disturbance and excavation of peat has been treated as a constraint during the design process. The Development infrastructure has been designed to utilise as much of the existing Operational Corkey Windfarm infrastructure as practicable. In addition, turbine locations have been sited to avoid deep and active peat where possible and overall the layout design has considered areas of previously disturbed ground. Where the potential exists for deep and active peat to be disturbed, appropriate best practice mitigation will be implemented during the construction while specific compensatory measures will take place in line with the proposals in **Technical Appendix A8.3 Draft Habitat Management Plan.** Disturbance, excavation and management of peat are discussed in **Technical Appendix A3.1 Outline DCEMP**

101. The existing network of access tracks which serve the Operational Corkey Windfarm have been utilised, where possible, limiting the requirement to disturb peaty soils to access the Development. The access tracks have been designed to avoid crossing watercourses, where possible. Further description of this is provided in **Chapter 4: Site Selection & Design** of this ES.

102. The Outline DCEMP and Outline WCEMP describes water management measures to control surface water run-off and drain hardstandings and other structures during the decommissioning construction and operational phases of the Development. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Development under planning condition, prior to the initial Decommissioning/Construction phases.

103. The 50 m buffer zone of watercourses mapped at the 1:50000 scale and 20 m buffer zone of drains and smaller watercourses, in conjunction with the measures set out in both the Outline DCEMP and Outline WCEMP (provided as **Technical Appendix A3.1** and **Technical Appendix A7.2)** will be sufficient to avoid potential effects on the hydrological and hydrogeological resource, as their effectiveness has been demonstrated on the Applicant's windfarm construction sites to date due to the measures implemented and a clear process for any remedial actions followed, which have been to the best practice standards outlined in CIRIA guidance[13].

104. Conclusions state whether the residual significance will be major, moderate, minor or negligible, once appropriate mitigation (beyond that specified in the CEMPs) has been implemented. This assessment relies on professional judgment to ensure that the effects are appropriately assessed.

105. A residual effect is considered to be a likely significant effect in accordance with the EIA Regulations if assessed as moderate or major following the preceding methodology.

7.5.1 Good Practice

106. Good practice will be followed in all aspects of construction, operation and decommissioning, specifically through a PPP as described in **Section** Error! Reference source not found., which will be incorporated into a full DCEMP, to be agreed with NIEA prior to the initial Decommissioning/Construction phase.

107. The PPP will set out measures to be employed to avoid or mitigate potential effects for all phases of the Development, and will also include an Incident Plan to be followed should a pollution event occur. This plan will be produced following consultation and agreement with NIEA and all appropriate personnel working on the construction site will be trained in its use. The Construction Project Manager will have specific responsibility for implementation of the PPP.

108. Method statements will also be applied, which will follow the principles laid out in the relevant GPPs and PPGs[10].

7.6 Assessment of Potential Effects

109. The effect of the Development on hydrological receptors has been considered for both the decommissioning/construction and operational phases of the Development. Effects occurring during decommissioning/construction phases are considered to be short term effects, with those occurring as a result of the operational phase of the Development being considered to be permanent effects, however these effects are reversible upon future decommissioning.

7.6.1 Potential Decommissioning/Construction Effects

110. The nature and magnitude of effects that could result from the initial decommissioning/construction activities, as described in **Chapter 3: Development Description**, are assessed in the following paragraphs, which include:

- The upgrade of existing access tracks where necessary from the operational Corkey Windfarm for the construction of the Development;
- Establishment of temporary decommissioning/construction compounds comprising a hardstanding area, waste management area, temporary facilities and a fuel storage area;
- Decommissioning of the Operational Corkey Windfarm; and
- Construction of new access tracks where necessary, turbines and associated infrastructure and hardstandings for the Development.

7.6.1.1 Chemical Pollution

111. Potential effects involved with the management of decommissioning/construction activities are more a risk management issue, with the effects being assessed should the risk be realised. Should the Development proceed as described in **Chapter 3: Development Description**, *e.g.*, with no spills, there would be no effects.

112. Potential risks include the spillage or leakage of chemicals, fresh concrete, foul water, fuel or oil, during use or storage onsite. These pollutants have the potential to adversely affect soils, subsurface water quality, peat, surface water quality, and groundwater, and hence effects on the biodiversity of receiving watercourses.

7.6.1.1.1 Surface Hydrology

113. Watercourses could be at risk from a pollution incident during the initial decommissioning/construction phases. All surface watercourses and surface water bodies are considered to be of High sensitivity.

114. Buffer distances between the proposed decommissioning/construction works and watercourses have been maximised to reduce the potential for chemical pollutants to be transferred to the water environment. A 50 m buffer between watercourses and infrastructure (excluding watercourse crossings) and a 20 m buffer between man-made drains and smaller watercourses and infrastructure has been adopted where possible.

115. Measures such as absorbent spill pads / kits and other measures highlighted within **Technical Appendix A7.2 Outline WCEMP** will effectively limit the uncontained release of chemicals to minor fugitive releases. These would be minimised through best practice construction methods such as vehicle speed limits and regular vehicle and machine maintenance.

116. It has not been possible to place the hardstanding for T2, 20 m from a man-made drain as a result of peat constraints, although during the design process the turbine was relocated to the west in order to maximise separation distance from the nearby gully. The hardstanding at T2 is located 5 m from a man-made drain while the turbine is located 20 m west of the drain.

117. A cut off ditch will be installed downslope of T2 between the hardstanding and the man-made drain**.** This will provide attenuation in the event of a chemical spill and will be used in conjunction with best practice measures.

118. The hardstanding at T5 encroaches on a small unnamed watercourse. The preferred option would be to culvert the watercourse in order to construct the hardstanding. T5 is located approximately 45 m south-east of the watercourse. Should a culvert not be technically feasible the watercourse will be diverted, following detailed design of the hardstanding area. The detailed design would aim to minimise direct works to the watercourse. Any works in the vicinity of the watercourse relating to the installation of the culvert, diversion or necessary over-pumping would take place during a dry period to minimise effects on the water environment. Works will be carried out in accordance with GPP5: works or maintenance in or near water. Further details of water management and watercourse crossings are provided in **Technical Appendix A7.2 Outline WCEMP**.

119. Therefore, after taking into account the proposed mitigation outlined within paragraphs 116 to 118, effects on these watercourses, of High sensitivity, have the potential to be of negligible magnitude and therefore (in accordance with **Table 7.4**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.2 Groundwater and Near-surface Water

120. Pollutants coming into contact with bedrock also have the potential to alter the quality of the groundwater resource. pH and chemical alterations to groundwater are difficult to rectify due to the fractured nature of the rock and the lengthy attenuation and dispersal of chemicals. As noted previously, due to the underlying superficial geology consisting of glacial till and peat, groundwater is unlikely to be present near the surface, meaning there is limited potential for pollutants to come into contact with groundwater.

121. Measures such as spill pads, impermeable geotextile membranes and measures described within **Technical Appendix A7.2: Outline WCEMP** will effectively limit the uncontained release of chemicals to minor fugitive releases. Therefore, effects on bedrock and groundwater have the potential to be of negligible magnitude for receptors of High sensitivity and therefore (in accordance with **Table 7.4**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.2.1 Private Water Supplies

122. PWS could be at risk from a pollution incident during decommissioning/construction activities. All PWS within the catchment of Development infrastructure are considered to be of Medium sensitivity.

123. The sources for the PWS serving 208 and 218 Corkey Road and neighbouring properties, as outlined in **Table 7.6**, lie beyond 250 m of any Development infrastructure and as such fall outside the recommended buffer to infrastructure as detailed in the NIEA guidance on assessing the effect of developments on groundwater abstractions[35]. The locations of PWS sources are shown in **Figure 7.5**.

124. Measures such as absorbent spill pads / kits highlighted within Sections 3 and 4 of the **Technical Appendix A7.2 Outline WCEMP** will effectively limit the uncontained release of chemicals to minor fugitive releases, if at all. These would be minimised through best practice construction methods such as vehicle speed limits and regular vehicle and machine maintenance.

125. Additionally, the temporary construction compound, where the majority of potential pollutants will be stored, is located 500 m and 1 km from the known source of the supplies for 208 and 218 Corkey Road respectively. Best practice mitigation, including bunding of fuel storage areas and impermeable membranes underlying fuel storage, will limit the release of chemicals to minor fugitive releases.

126. Therefore, effects on these PWS, of Medium sensitivity, have the potential to be of negligible magnitude and (in accordance with **Table 7.4**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.3 Erosion and Sedimentation

127. Erosion and sedimentation can occur from excavations, de-watering, ground disturbance and overburden stockpiling. Sediment entering watercourses has the potential to affect water quality, ecology and flood storage capacity.

7.6.1.3.1 Surface Hydrology

128. Given the overland distance between construction areas and watercourses (with the exception of T2 and T5), any silt or other materials carried by overland flow as a result of the initial decommissioning/construction activities are likely to be entrained in vegetation and man-made drainage ditches (in the absence of intervening good practice measures) before reaching watercourses, with the exception of the new and upgraded watercourse crossings. New and upgraded watercourse crossings are shown in **Figure 7.5**. Other Sustainable Drainage System (SuDS) measures, such as the use of settlement lagoons, swales and interception bunds, will effectively prevent sediment entering watercourses via drainage ditches adjacent to access tracks. As such, there will be limited potential for sediment or erosion effects on watercourses in the Study Area, including the hydrology and water quality of onsite watercourses, further details of these measures are outlined in Sections 2, 5 and 6 of **Technical Appendix A7.2.** Vigilance will be maintained when working within the man-made drain buffer at T2. The use of a cut-off ditch placed between the infrastructure and drain will provide additional attenuation of sediment generated during construction. Best practice measures will be used in conjunction with the cut-off ditch and will protect the water environment.

129. The preferred option would be to culvert the watercourse in order to construct the hardstanding. T5 is located approximately 45 m south-east of the watercourse. Should a culvert not be technically feasible the watercourse will be diverted, following detailed design of the hardstanding area. The detailed design would aim to minimise direct works to the watercourse. Any works in the vicinity of the watercourse relating to the installation of the culvert, diversion or necessary over-pumping would take place during a dry period to minimise effects on the water environment. Works will be carried out in accordance with GPP5: works or maintenance in or near water. Further details of water management and watercourse crossings are provided in **Technical Appendix A7.2 Outline WCEMP**.

130. Works in the vicinity of T2 and T5 will be carried out in accordance with GPP5.

131. For these reasons, after taking into account the proposed mitigation within paragraphs 129 to 130 , the magnitude of this effect will be negligible. Given the High sensitivity of the watercourses and negligible magnitude of effects, the significance of effects associated with erosion and sedimentation is assessed as being negligible. This is **not significant** in terms of the EIA Regulations.

7.6.1.3.2 Groundwater and Near Surface Water

132. Sediment also has the potential to change near-surface water flow in superficial geology deposits and peaty soil characteristics by creating a physical barrier within naturally occurring drainage micropores. Sediment entering near-surface water in superficial deposits also has the potential to impact on groundwater quality within bedrock deposits / fissures.

133. Measures described in **Technical Appendix 7.2**, such as impermeable ground membrane layers and bunded areas, will effectively prevent sediment entering sub-surface water in superficial deposits (and groundwater) and peat. For these reasons, the magnitude of this effect will be negligible. Given the High sensitivity of near-surface water and groundwater and negligible magnitude of effect, the significance of the effect associated with erosion and sedimentation is considered to be minor. This is **not significant** in terms of the EIA Regulations.

7.6.1.3.3 Private Water Supplies

134. The quality of PWS could be affected by sediment mobilisation. All PWS within the catchment of Development infrastructure are considered to be of Medium sensitivity.

135. Measures detailed in **Technical Appendix 7.2 Outline WCEMP** will limit the potential for the mobilisation of sediment and safeguard the water environment.

136. Therefore, effects on PWS of Medium sensitivity, have the potential to be of negligible magnitude and therefore (in accordance with **Table 7.4**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.4 Impediments to Flow

137. The access tracks will require the installation of five new watercourse crossings across all sections of the Development. Additionally, the upgrade of the existing access tracks which serve the Operational Corkey Windfarm will involve upgrade of the existing watercourse crossings, therefore minimising the potential for impediment to flow created by additional new crossings. Watercourse crossing locations are shown in **Figure 7.5**.

138. The minimisation of the number of proposed watercourse crossings and the upgrade of the existing watercourse crossings reduces one of the main activities that could give rise to impediment of flows. Additionally, measures described in **Section 6.4** of **Technical Appendix 7.2 Outline WCEMP**, such as the use of a wide bottomless-arched culverts, where appropriate, are likely to prevent impediments to flow being created. Detailed design will be carried out at the construction phase and will be agreed with NIEA.

139. The culvert required to accommodate T5 hardstanding will be installed by diverting or over-pumping the unnamed watercourse and installing a culvert in line with best practice outlined in **Section 6.4 of the Technical Appendix A7.2 Outline WCEMP)** and CIRIA Culvert Design and Operation Guide.

[35] Wind Farms and Groundwater Impacts, Practice Guide. NIEA (2015). Available online at: https://www.planningni.gov.uk/index/advice/northern_ireland_environment_agency_guidance/wind_farms_and_groundwater_impacts-3.pdf [Accessed on 11/01/2019]

140. All watercourse crossings will be designed to CIRIA C689 guidance and will convey flow plus an uplift for climate change. The Applicant or their construction contractor will apply for consents to install culverts under the Drainage (Northern Ireland) Order 1973 - Schedule 6 Application Process.

141. Therefore, the effects on watercourses of High sensitivity are considered to be of negligible magnitude and, therefore of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.5 Changes in Soil and Peaty Soil Interflow Patterns

142. Some turbine base excavations may need temporary sub-surface water controls, such as physical cut-offs or de-watering. These temporarily divert flows away from the excavation, and temporarily lower the local water table and sub-surface water levels in peat. Localised temporary changes to soil and peat interflow patterns may therefore arise. Turbine foundations and crane hardstandings also have the potential to change sub-surface water flow by creating physical barriers within naturally occurring drainage macropores in soil or peat.

7.6.1.5.1 Soils

143. The drying out of peaty soil can result from alterations to the natural drainage regime. Measures set out in the Section 8 of **Technical Appendix 7.2 Outline WCEMP**, such as the rewetting of peat through controlled irrigation techniques, are considered sufficient, and sufficiently reliable, to avoid substantial alterations to the natural drainage regime, particularly given the shallow nature of soils and absence of peat at turbine locations. As a result, peat is not expected to dry out, beyond what would be the case in the baseline scenario. No substantial impediments to near-surface water flow will be created as the detailed site drainage design will take into account any severance of saturated areas to ensure hydrological connectivity is maintained, in accordance with SEPA / SNH 'Good practice during wind farm construction' in the absence of equivalent NIEA guidance.

144. Consequently, effects on soil (Medium sensitivity receptor) are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.5.2 Groundwater and Near-Surface Water

145. No substantial impediments to near-surface water flow will be created as the detailed site drainage design will take into account any severance of saturated areas to ensure hydrological connectivity is maintained, in accordance with SEPA / SNH 'Good practice during wind farm construction'.

146. Consequently, effects on groundwater and near surface Water (High sensitivity receptors) are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.5.3 Private Water Supplies

147. The quantity of PWS could be affected by changes in groundwater interflow patterns as a result of de-watering or the effect of turbine foundations and hardstandings on subsurface flow. 208 Corkey Road is supplied by near-surface water and 218 Corkey Road is supplied by near-surface water in conjunction with a borehole. All PWS within the catchment of Development infrastructure are considered to be Medium sensitivity.

148. No PWS are within the NIEA 250 m buffer zone of Development activity and infrastructure.

149. Should dewatering be required measures detailed in Section 7.2 of the Outline WCEMP will maintain groundwater flow paths.

150. Therefore, effects on these PWS, of Medium sensitivity, have the potential to be of negligible magnitude and therefore (in accordance with **Table 7.4**) of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.6 Effects on the Function of Wetland Habitats

151. Wetland habitats supporting bog communities are present within the Study Area with potential for hydrological effect from the Development.

152. Blanket Bog is a Northern Ireland Priority Habitats and is likely to have some degree of groundwater dependency, and is present within the Study Area as set out in **Chapter 8: Ecology and Fisheries**. There is potential for the Development to impact the quality and quantity of water supplied to this habitat.

153. An area of Blanket Bog is present within the north-east of the Study Area occurring within the footprint of T1 hardstanding and access tracks and turning arcs.

154. Excavations associated with access tracks are likely to be less than 1 m in depth and restricted to the footprint of the access track. The footprint of the proposed Development turbines where excavations may reach up to 3 m with potential for indirect disturbance effects to surrounding wetland habitats may also occur from T1. Near-surface water flow through superficial deposits may be disrupted by the cut and fill of the access tracks to T1 and T2, as the installation of aggregate may cause a physical blockage to water flow in micro and macropores within the wetland habitats, where the access track runs perpendicular to the natural flow.

155. A total of 207,816 m^2 of Blanket Bog is present within the Study Area and 1,250 m^2 will be lost as a result of the initial decommissioning/construction activity, this equates to a loss of 0.6 % of Blanket Bog habitat. As such, direct hydrological effects will equate to a 'minimal detectable effect on a wetland habitats (between to 0.1 % - 5 % of the Study Area) or no discernible effect on its integrity as a feature or its functionality' in accordance with **Table 7.3**. Therefore the magnitude of the loss of wetlands will result in a negligible effect. Given the Low sensitivity (as set out in **Table 7.9**) and negligible magnitude of the effect, the significance of effects associated with the loss of wetland habitats is negligible. This is **not significant** in terms of the EIA Regulations.

156. Details of Habitat Management are discussed further in **Chapter 8: Ecology and Fisheries** and detailed in **Technical Appendix A3.2 Draft Habitat Management Plan.** In total 9.41 ha of bog habitat is located in areas that will benefit from restoration providing an environmental benefit overall.

7.6.1.7 Bedrock Excavation

The development of new access tracks, hardstandings, substation and compounds may result in a small quantity of rock being excavated from within the Development footprint. However, construction materials will be imported and borrow pits are not proposed. Therefore, in the context of the geological resource, any extraction volumes are small and for this reason, the magnitude of the loss of bedrock will be negligible.

Given the low sensitivity (as set out in **Table 7.9**) and negligible magnitude of effect, the significance of effects associated with the loss of bedrock is negligible. This is **not significant** in terms of the EIA Regulations.

7.6.1.8 Peat Disturbance

157. The Development layout has been designed to ensure that infrastructure is located within the shallowest peat areas possible, utilising as much of the existing infrastructure as possible. Considering the peat depths recorded and the active peat assessment, only T1 and associated infrastructure, and localised track widening, lies within the vicinity of deep and active peat. At the proposed T1 location, an existing turbine foundation and hardstand lie within the Development footprint, therefore this area can be re-used supplemented by widening of existing infrastructure at the existing levels, which will constitute a large part of the proposed construction works. Additionally, while there is deep and active peat noted surrounding this turbine position, the turbine itself is located in a highly-modified area where peat depths were recorded as less than 1.0 m in depth.

158. The assessment of peat disturbance has highlighted localised areas of deep peat and active peat could be at risk from the Development, in particular the area of T1. The magnitude of effect is considered to be low due to the potential for disturbance being a 'Small loss of soils or peatland, or where soils will be disturbed but the value not impacted'.

159. On this basis, through design and site layout considerations, the Development is considered to result in a minor significance effect in accordance with the EIA Regulations. Implementation of the specific mitigation and compensation proposed as part of the Draft HMP and adoption of best practice methods as included in the final PMP and HMP would further reduce the effect.

7.6.1.9 Peat Destabilisation

160. Peat instability is generally the result of a combination of causative factors. Several construction activities have the potential to increase the likelihood of peat slides in areas where peat is present at a sufficient depth and where gradients are sufficiently steep to result in a peat slide event.

161. Activities that have the potential to increase the likelihood of peat slides include locating proposed infrastructure including track networks on sloping ground which often involves removal of surface vegetation and excavation of peat and other soils.

162. Due to the presence of peat, a PSRA was undertaken and is included in **Technical Appendix A7.1 Peat Slide Risk Assessment.** This PSRA was carried out in accordance with the Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, 2017,

163. Peat slides can affect soils and local sensitive habitats and have the potential to affect surface water systems from soil inundation, leading to sedimentation. This can have an effect by reducing water quality and/or modify drainage patterns. Receptors identified across the Study Area are:

- Active Peat;
- Existing windfarm infrastructure;
- Existing minor watercourses; and
- Proposed windfarm infrastructure.

164. Within the Development footprint, the assessment concluded the majority of the Development Infrastructure lies in an area of 'low risk'. Out with the Development footprint, localised medium and negligible risk zones hazard ranks were concluded. On this basis, in the absence of mitigation, the Development is considered to result in a potential effect of negligible significance and would therefore **not be significant**, in accordance with the EIA Regulations.

165. Good practice measures are embedded in the design principles and adoption of further best practices, will reduce any effect of peat instability.

166. Details of peat destabilisation are included in **Technical Appendix A7.1 Peat Slide Risk Assessment**.

7.6.1.10 Increase in Runoff

167. The increase in hardstanding area associated with the initial decommissioning/construction phases and during the operation of the Development could increase the volume and rate of localised surface run-off, although a large proportion of the proposed infrastructure, including access tracks and crane hardstandings, would be permeable to some extent. The impermeable nature of the thin soils onsite and the underlying geology, however, means that, in the baseline scenario, there will be relatively low infiltration and relatively high run-off rates, and hence the addition of the Development when considered against the existing baseline conditions, would have minimal effect on the existing run-off scenario.

168. Measures, including SuDS measures, to attenuate run-off and intercept sediment prior to run-off entering watercourses are described in Section 2 of **Technical Appendix A7.2 Outline WCEMP** and form an inherent part of the Development.

169. For these reasons, the effect on watercourses of High sensitivity are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.1.11 Flood Risk

170. No construction compounds, substations or meteorological masts are located within areas described as being at risk of flooding by the published NI Flood Maps[36].

171. The design process, resulting in the Development layout has incorporated a buffer zone between watercourses and turbine bases of 50 m to watercourses where possible, meaning any overtopping of minor watercourses is unlikely to reach infrastructure during extreme flooding events.

172. As such, the Development is not considered to be at risk of flooding and is unlikely to contribute to the displacement of pluvial flood water.

173. For these reasons, the effect on watercourses of High sensitivity are considered to be of negligible magnitude and therefore negligible significance. This is **not significant** in terms of the EIA Regulations.

7.6.2 Potential Operational Effects

174. Potential effects associated with the operation of the Development are:

- Increased run-off rates and volume;
- Continued erosion and sedimentation from runoff from areas of hardstanding;
- Alterations to natural flow pathways from runoff from areas of hardstanding; and
- A risk of a pollution event from minor spills from maintenance vehicles.

175. The nature of these effects has been discussed in relation to the initial decommissioning/construction phases. As there would be substantially less activity during operation, and as there is unlikely to be any significant ground disturbance during operation, the magnitude of these effects is similarly reduced.

176. There will be a minor reduction in the potential for increased surface water run-off during the operational phase due to the reduction in hardstanding areas used during the initial decommissioning/ construction phases, such as the removal of the construction compounds.

177. Construction compounds may be temporarily reinstated to support future activities as required. The impact of reinstatement of these areas on runoff will be minimal.

178. Whilst alterations to natural flow pathways will not be introduced during the operational phase, any changes during the initial decommissioning /construction phases will continue through operation, as the majority of infrastructure will remain in place. Alterations to natural flow pathways will be reduced through adopting good practice design and construction methods, as set out in the outline DCEMP, such as cross drainage, use of shallow drainage ditches and prevention of blockages.

179. As a result, the magnitude and significance of all effects associated with operation of the Development are assessed as being negligible, and **not significant** in terms of the EIA Regulations.

7.7 Mitigation and Residual Effects

180. Embedded mitigation measures and construction good practice measures are included in **Technical Appendix 7.2 Outline WCEMP**. The embedded mitigation and construction good practice measures are based on experience of providing detailed site design for several windfarm developments across the UK.

181. Effects on peat are assessed as being of minor significance. Implementation of the specific mitigation and compensation proposed as part of the Draft HMP and adoption of best practice methods as included in the final PMP (**Technical Appendix A7.4**) and Draft HMP (**Technical Appendix A3.2**) would further reduce the effect, although the residual effect remains assessed as minor.

182. With the embedded mitigation measures described in **Technical Appendix 7.2 Outline WCEMP**, all identified potential effects have been assessed as being of negligible significance, with the exception of effects on peat, as set out above. The embedded mitigation measures proposed are established measures that are widely used in construction projects and which the Applicant and its contractors are well used to undertaking. Given the levels of certainty in the success of application of the mitigation measures and their effectiveness it is appropriate that these form an inherent part of the Development and are taken into account and assumed to be fully effective in the determination of this application.

183. No significant residual effects are predicted for all phases of the Development, and are therefore **not significant** in terms of the EIA Regulations.

7.8 Assessment of Cumulative Effects

184. The methodology followed to assess the cumulative effects is the same as that used for the Development in isolation.

185. A cumulative effect is considered to be an additional effect on hydrological resources (within the same hydrological catchment) arising from the Development in addition to the combination of other developments likely to affect the hydrological environment. At distances greater than 10 km, it is considered that schemes are unlikely to contribute to a cumulative

[36] Flood Maps NI (2016). Available online at: https://www.infrastructure-ni.gov.uk/topics/rivers-and-flooding/flood-maps-ni [Accessed 11/01/2019].

hydrological effect due to attenuation and dilution over distance of potentially polluting chemicals. Therefore, for the purposes of the assessment of potential cumulative effects on the immediate catchment and hydrological regime, only proposed developments, which require large scale construction / excavation, within approximately 10 km of the Development have been considered. Single wind turbine developments have not been included in the cumulative assessment due to the limited potential for decommissioning, construction or operational effects.

7.8.1 Cumulative Developments within 10 km (consented or under construction)

186. The following cumulative developments have been identified within the Wider Study Area:

- Armoy windfarm (Appeal) 8.7 km north of the Development.

187. Operational wind farms (Altaveedan, Rathsherry, Gruig, Glenbuck and Garves) are considered to form part of the baseline for the purposes of cumulative assessment.

7.8.2 Predicted Cumulative Effects

188. The greatest potential for cumulative effects arises when the construction phase of another development overlaps with the initial decommissioning/construction phases of the Development. Cumulative effects are considered to have the potential to be significant only where such an overlap may exist, as activities that could be potentially detrimental to the hydrological environment are greatly reduced during the operational phase of developments (e.g. excavation works, concrete pouring etc.).

189. Armoy windfarm is located in the overall catchment of the Bush River. As the Development is not likely to commence construction until 2023 and assuming an 18-month construction period for Armoy windfarm, there is potential for an overlap in construction effects. Implementation of the measures detailed in **Technical Appendix A7.2 Outline WCEMP**, mean that the magnitude of any potential effects from the Development have been assessed as negligible as detailed in paragraphs 109 to 173 of this Chapter. Furthermore it is assumed that cumulative developments, will implement similar measures as required by NIEA and best practice guidance,

190. It is anticipated that there will be a minor reduction in the potential for increase in run-off rates during the operational phase of the identified wind farm developments, when compared to the construction phase, due to the reduction in overall hardstanding areas post-construction. Therefore, the magnitude of cumulative effects during the operational phase will be negligible, and the significance of these effects will also be negligible, being not significant in terms of the EIA Regulations.

191. Given the reasons outlined, the magnitude of cumulative effects during the initial decommissioning /construction and operational phases will be negligible and therefore, of negligible significance. This is **not significant** in terms of the EIA Regulations.

7.8.3 Residual Cumulative Effects

192. No significant residual cumulative effects are predicted.

7.9 Summary of Effects by Receptor

193. This section, and **Table 7.10**, provide a summary of predicted effects for each receptor type in turn, including the combination, or inter-relationship of different effect pathways on the same hydrological receptor.

7.9.1 Watercourses

194. All effects on watercourses are assessed as being negligible, given the embedded mitigation.

7.9.2 Groundwater and Near-Surface Water

195. All effects on groundwater and near-surface water are assessed as being negligible, given the embedded mitigation.

7.9.3 Wetland Habitats

196. All effects on wetland habitats are assessed as being negligible, given the embedded mitigation.

7.9.4 Soils

197. All effects on soils are assessed as being negligible, given the embedded mitigation.

7.9.5 Peat

198. Effects on peat are assessed as being minor, given the embedded and specific mitigation and compensation proposed.

7.9.6 Private Water Supplies

199. All effects on PWS are assessed as being negligible, given the embedded mitigation.

200. The overall effect, being the combination of these effects, is also assessed as being negligible.

Table 7.10 Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Significance
Initial Decommissioning/Construction phases				
Watercourses, Groundwater and Near-surface water	Chemical Pollution	Negligible	None	Negligible
Watercourses	Chemical Pollution	Negligible	None	Negligible
PWS	Chemical Pollution	Negligible	None	Negligible
Watercourses, Groundwater and Near-surface water	Erosion and Sedimentation	Negligible	None	Negligible
PWS	Erosion and Sedimentation	Negligible	None	Negligible
Watercourses	Impediments to Flow	Negligible	None	Negligible
Groundwater, Near-surface water and GWDTE	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
PWS	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
Watercourses	Increase in Run-off and Flood Risk	Negligible	None	Negligible
Peat	Peat Disturbance	Minor	Best Practice Measures for management and storage of peat and peaty soils. Compensation through localised peat bog restoration and implementation of the measures outlined with the Draft HMP.	Minor

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Significance
Peat	Peat Stability	Negligible	Implementation of drainage measures in accordance with best practice. Best Practice Measures for avoiding peat and the management of peat and peaty soils.	Negligible
Operational Phase				
Watercourses	Increase in Run-Off and Flood Risk	Negligible	None	Negligible
Watercourses, Groundwater and Near-surface water	Erosion and Sedimentation	Negligible	None	Negligible
PWS	Erosion and Sedimentation	Negligible	None	Negligible
Groundwater, Near-surface water, GWDTE and PWS	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
PWS	Changes in Groundwater Interflow Patterns	Negligible	None	Negligible
Watercourses, Groundwater and Near-surface water	Risk of a Pollution Event from Minor Spills from Maintenance Vehicles	Negligible	None	Negligible
PWS	Risk of a Pollution Event from Minor Spills from Maintenance Vehicles	Negligible	None	Negligible

7.10 Statement of Significance

201. This Chapter has assessed the likely significance of effects of the Development on hydrology and hydrogeology. With the embedded mitigation measures proposed, the Development has been assessed as having the potential to result in effects of negligible or low significance.

202. Given that only effects of moderate significance or greater are considered significant in terms of the EIA Regulations, the potential effects on hydrology and hydrogeology are considered to be **not significant**.

8 Ecology and Fisheries

8.1 Introduction

1. This Chapter of the Environmental Statement (ES) evaluates the effects of the Development on ecosystems and their components, including designated sites, habitats, flora and fauna. The chapter was written by NM Ecology Ltd Ecological Consultants, supported by a specialist fisheries / aquatic ecology assessment by Paul Johnston Associates. The assessment considers the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of Operational Corkey Windfarm (initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (final phase).

2. The decommissioning of Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase of the Development has not been considered further in this assessment.

3. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4.**

4. This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 3 Technical Appendices**:

Technical Appendix A8.1 Habitat and Peat Assessments;
Technical Appendix A8.2 Habitats Regulations Assessment;
Technical Appendix A8.3 Bat Report; and
Technical Appendix A8.4 Fisheries Report.

5. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

8.2 Legislation, Policy and Guidance

1. The assessment has been prepared in accordance with the *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*[1], which is the primary resource used by members of the Chartered Institute of Ecology and Environmental Management (CIEEM).

2. The key legislation relating to nature conservation in Northern Ireland is as follows:

- Wildlife and Natural Environment Act (Northern Ireland) 2011;
- Environment Order (Northern Ireland) 2002;
- Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995;
- Nature Conservation and Amenity Lands Order 1985;
- Wildlife (Northern Ireland) Order 1985; and
- Fisheries (Northern Ireland) Act 1966.

3. In addition, the following policy has been considered:

- The Northern Area Development Plan 2016;
- Department of the Environment: Planning Policy Statement 2: Natural Heritage;
- Department of the Environment: Practice Guide: NI Biodiversity Checklist;
- Department of the Environment: Standing Advice documents for relevant taxa; and
- Northern Ireland Environment Agency: Survey Specifications for Bats, Badgers, Habitats, Common Lizard, Smooth Newt.

8.3 Assessment Methodology and Significance Criteria

8.3.1 Scoping Responses and Consultations (Heading 3)

4. Consultation for this EIA topic was undertaken with the organisations shown in **Table 8.1**. Full responses to the request for a Scoping Opinion are provided in **Technical Appendix A2.2**.

Table 8.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Northern Ireland Environment Agency, Natural Environment Division	Meeting 31/05/17	Scoping in relation to peat and bats	The methods for assessments of peat and bats were revised accordingly
Shared Environmental Services, Mid and East Antrim Borough Council	Written 10/10/2017	Scoping in relation to indirect effects on designated sites	Potential effects on designated sites are addressed in this chapter, including potential hydrological effects on distant sites
Department of Agriculture, Environment and Rural Affairs, Sea Fisheries Division	Written 28/09/2017	Expectations for work in the vicinity of watercourses	Pollution-prevention measures are included in this chapter and in **Chapter 7: Hydrology, Hydrogeology, Geology, Soils and Peat**
Forest Service, Grants and Regulations Branch	Written 11/10/2017	Information on forestry and ecological records from the surrounding area, including Slieveanorra Forest, birds and designated sites	These records have been considered during the preparation of the EcIA and associated reports. No forests will be affected by the Development
Northern Ireland Environment Agency, Natural Environment Division	Written 10/10/2017	Formal response to scoping report, and comments on issues that should be addressed in the ES	The comments have been taken into account during the preparation of the EcIA and associated reports
Northern Ireland Environment Agency, Natural Environment Division	Meeting 04/12/18	Discussion of peatland habitats, habitat management, and bats.	Feedback from the NIEA-NED has assisted with the preparation of the EcIA
Northern Ireland Environment Agency, Natural Environment Division	Site meeting 21/02/19	Queries were raised about active peat at the access roads and hardstands for Turbines 2 and 3, and additional surveys were requested	Detailed active peat assessments were carried out at these locations. The results are summarised in the EcIA and reproduced in full in **Technical Appendix A8.1**

[1] Chartered Institute of Ecology and Environmental Management, 2018. *Guidelines for Ecological Impact Assessment in the U.K and Ireland: Terrestrial, Freshwater, Coastal and Marine*. C.I.E.E.M., Hampshire, England.

8.3.2 Scope of Assessment

5. Following desk studies, field surveys and consultation undertaken to date, the following elements have been scoped into the EcIA:

- Direct effects on the qualifying interests of the Antrim Hills Special Protection Area (SPA) (refer to **Chapter 9: Ornithology**);
- Possible indirect effects on fisheries and other aquatic fauna in the Killagan Water, the River Main and the Lough Neagh / Lough Beg SPA due to surface water runoff from the development during both the construction and operation phases;
- Direct effects on active peat and Northern Ireland Priority Habitats during the initial decommissioning and construction works;
- Possible direct and indirect effects on badger setts during the initial decommissioning and construction works; and
- Possible direct effects on foraging / commuting bats during the operation of the Development.

8.3.3 Elements Scoped Out of Assessment

6. All effects on non-avian ecological receptors other than those set out in **Section 8.3.2** have been scoped out of the EcIA, on the basis that they will not receive significant effects or they are absent from the Study Area. In particular, the following potential receptors have been scoped out of the EcIA:

- Any designated sites other than those discussed above;
- Upland acid grassland and improved grassland habitats;
- Rare or protected flora;
- All terrestrial mammals other than badger;
- Common lizards and smooth newts;
- Marsh fritillary butterflies or any other protected / priority invertebrates; and
- Direct effects on fisheries and other aquatic fauna.

8.3.4 Study Area

7. Potential indirect effects on designated sites of international importance (Natura 2000 sites) and national importance (Areas of Special Scientific Interest, ASSIs, and National Nature Reserves, NNRs) were considered within a Study Area of 15 km, measured from the centre of the Site. Potential indirect effects of Sites of Local Nature Conservation Importance (SLNCIs) were considered within a Study Area of 5 km from the centre of the Site. Biological records from public databases (e.g., the National Biodiversity Atlas) were considered within 5 km of the centre of the Site. These Study Areas are shown in **Figure 8.1**.

8. The Study Area for most habitats, flora and fauna consisted of the Indicative Developable Area at the time of Scoping, i.e. all areas under consideration for the Development, with a buffer zone of up to 200 m for relevant species. The Study Area for fisheries included downstream watercourses, notably the Killagan Water and River Main. Other ecological features encountered incidentally outside the Study Area (e.g., badger setts) have also been included in this assessment.

8.3.5 Design Parameters

9. All relevant aspects of the design of the Development are outlined in **Chapter 3: Development Description.**

8.4 Methodology

10. This assessment has been developed using the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance, which provides a transparent and robust approach for ecological impact assessments, using the following stages:

- Collation of baseline ecological information through desk study and field surveys;
- Identification of Important Ecological Features (IEFs) including designated sites, protected / priority species and habitats;
- Identification and characterisation of effects on IEFs including positive or negative, extent, magnitude, duration, timing, frequency and reversibility;
- Assessment of cumulative effects;
- Proposals for design and mitigation measures to avoid and/or minimise effects on IEFs;
- Assessment of residual effects following the implementation of design and mitigation measures; and
- Identification of appropriate compensation measures to offset significant residual effects and opportunities for ecological enhancement.

8.4.1 Desk Study

11. A desk-based scoping study was carried out using data from the following sources:

- Plans and specifications for the Development;
- Designated sites from the Northern Ireland Environment Agency website;
- Records of flora and fauna obtained from the Centre for Environmental Data and Recording and the National Biodiversity Atlas; and
- Records of bat roosts and activity obtained from the Northern Ireland Bat Group.

8.4.2 Field Surveys

12. Habitat surveys were carried out using the methods and classification system of the *Handbook for Phase 1 habitat survey*[2]. Where possible, peatland habitats and any other Northern Ireland Priority Habitats were classified using the National Vegetation Classification (NVC)[3] system. Flora were identified using *New Flora of the British Isles*[4], *The Vegetation Key to the British Flora*[5], and *Mosses and Liverworts of Britain and Ireland*[6]. Nomenclature follows the plant crib of the Botanical Society of the British Isles[7]. In most cases the abundance of species was categorised using the DAFOR (Dominant, Abundant, Frequent, Occasional, Rare) scale, but for detailed habitat assessments the DOMIN scale was used.

13. Surveys for protected / priority fauna were undertaken during the walkover surveys, and the suitability of the habitat for other protected / priority fauna was assessed. All such surveys were undertaken with reference to the Northern Ireland Environment Agency's survey specifications.

8.4.3 Active Peat Assessments

14. In recognition of the high importance afforded to active peatland in the Department of the Environment's *Planning Policy Statement 18: Renewable Energy* (2012) and the *Strategic Planning Policy Statement for Northern Ireland: Planning for Sustainable Development* (2015), additional assessments were undertaken for any habitats that could qualify as 'active peat'. It is acknowledged that the classification of active peat habitats can be complex, particularly in disturbed habitats and around the margins of peatland bodies, so a bespoke classification system has been developed for this Development, in order to provide a systematic and transparent approach. The first step involved classifying habitats into three categories, as follows:

- Active peat: these areas supported the NVC M19 community, had a peat depth of >1 m, and intact hydrology;
- Possible active peat: these areas supported modified blanket bog (including drained / oxidised areas on deep peat), wet heath or heath - mire transition habitat, and peat depths of >0.5 m; or
- Not active peat: these areas did not support heath or bog vegetation, had a peat depth of <0.5 m, and/or a highly-modified hydrological regime.

15. Further assessments and fine-scale mapping were undertaken within the 'active peat' and 'possible active peat' zones, based on the presence of indicator plant species, the depth of the underlying peat layer, and the hydrological condition of the peatland unit (based on the NIEA-NED Guidance note on Active Peat[8]). Further detail of the approach to peat surveys is outlined in **Chapter 7: Hydrology, Hydrogeology, Geology, Soils and Peat**.

16. Initial habitat and peat assessments were carried out at the locations of all proposed Development infrastructure in order to characterise the habitat. Following an onsite meeting with the NIEA (Natural Environment Division) in February 2019, at which active peat at the proposed locations of Turbines 2 and 3 was discussed, intensive sampling was carried out at these locations. This involved carrying out a series of randomly-located quadrats (of 1 m x 1 m dimensions) across the extent of the

[2] Joint Nature Conservation Committee (2010). *Handbook for Phase 1 habitat survey - a technique for environmental audit*. JNCC, Peterborough, UK
[3] JNCC 2001 (eds Elkington, T., Dayton, N., Jackson, D.L., Strachan, I.M.). *National Vegetation Classification: field guide to mires and heaths*. JNCC, Peterborough, UK.
[4] Stace, C., 2010. *New Flora of the British Isles, 3rd Edition*. Cambridge University Press
[5] Poland, J., Clement, E., 2009. *The Vegetation Key to the British Flora*. John Poland and the Botanical Society of the British Isles, Southampton
[6] British Bryological Society, 2010 (eds Atherton, I., Bosanquet, S., & Lawley, M.). *Mosses and Liverworts of Britain and Ireland – a field guide*. British Bryological Society, UK.
[7] Botanical Society of the British Isles, 2007. *Plant species nomenclature checklist*. Botanical Society of the British Isles, Southampton
[8] NIEA 2012. *Development Management Team Advice Note: Active Peatland and PPS18*

hardstand and access tracks, with 35 no. quadrats at the proposed location of Turbine 2 and 32 no. quadrats at the proposed location of Turbine 3. The following data was collected in each quadrat:

- Peat depth, accurate to 0.1 m;
- The coverage of vascular plants and bryophytes, measured using the DOMIN scale;
- The cover of each *Sphagnum* and *Eriophorum* species, and their combined total;
- Cover of atypical plants (e.g. grasses, rushes) and bare peat;
- Hydrological condition, including anthropogenic modifications (e.g., vertical peat banks caused by turf cutting or erosion), and micro-topographical features (hummocks and hollows); and
- A decision on whether or not the habitat could overall be classified as active peat, and a rationale for the decision.

8.4.4 Bats

17. Bat surveys were scoped using the 3rd edition of the Bat Conservation Trust (BCT) (2016) guidelines[9], with reference to Chapter 10 of the BCT (2012) guidelines[10] regarding assessments of windfarm developments. It is noted that the BCT (2016) guidelines have recently been superseded by new guidelines published by Scottish Natural Heritage in 2019[11], but the SNH guidelines had not been published when the surveys were carried out in 2017, so all survey methods discussed in this report are based on the BCT (2016) guidelines.

18. The minimum survey effort for windfarms in the UK is outlined in **Table 10.2** of the BCT (2012) guidelines, with different levels of survey effort for sites with low, moderate or high suitability for bats. Using this approach, the Study Area was initially considered to have low suitability for bats. However, in order to provide a more accurate baseline assessment, the applicant elected to carry out a significantly higher level of automated-detector surveying, with sampling periods of 30 nights in spring, summer and autumn. Transect surveys were carried out during the spring, summer and autumn survey periods, as outlined in the BCT (2016) guidelines. Further details of methods used for bat surveys are provided in **Technical Appendix A8.3: Bat Report**.

8.4.5 Fisheries

A desk study was undertaken to review existing records of salmonid fisheries, ecological status and water quality in relevant watercourses using information from the Northern Ireland Environment Agency and other sources. Field surveys were then undertaken in the Study Area, including assessments of chemical status, physical habitat (e.g. substratum type, depth, flow velocity), aquatic invertebrates (the 'kick sampling' technique), habitat suitability for salmonids, and an electrofishing survey to assess juvenile fish stocks. Further details are provided in **Technical Appendix A8.4: Fisheries Report**.

8.4.6 Methodology for the Assessment of Effects

19. The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect. The process for the valuation and assessment of effects is taken from the CIEEM Guidelines, as outlined below.

8.4.6.1 Sensitivity of Receptors

20. The sensitivity of potentially-affected receptors has been assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement. Based on the information collected during the desktop and walkover surveys, an ecological value is assigned to each feature based on its conservation status at different geographical scales (**Table 8.2**). For example, a site may be of national ecological value for a given species if it supports a significant proportion (e.g. 5%) of the total national population of that species.

Table 8.2: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
International	International or European scale
National	Northern Ireland or the island of Ireland
Regional	Ulster, and/or the north-west coast of Ireland
County	County Antrim
Local	Corkey Hill and its immediate surroundings
Negligible	None, the feature is common and widespread

21. It is accepted that any development will have an effect on the receiving environment, but the significance of the effect will depend on the value of the ecological features that will be affected. The following is outlined in the CIEEM guidelines[1]: "*One of the key challenges in an Ecological Impact Assessment is to decide which ecological features (habitats, species, ecosystems and their functions / processes) are important and should be subject to detailed assessment. Such ecological features will be those that are considered to be important and potentially affected by the project. It is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to impacts from the development, and that will remain viable and sustainable.*"

22. For the purposes of this report, detailed assessments are only carried out for ecological features of Local value or higher, or that are Northern Ireland Priority Habitats or Species. These features are termed 'important ecological features' and are listed in **Section 8.5.6**. Features of Negligible ecological value (e.g., species-poor grasslands) are not considered to be material in decision making, so they are not included in the impact assessment.

8.4.6.2 Magnitude of Effect

23. The magnitude of potential effects has been identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect, professional judgement, best practice guidance and legislation. These terms are defined in the CIEEM guidelines[1], and are not reproduced here. The criteria used to describe the magnitude of an effect are presented in **Table 8.3.**

Table 8.3: Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
Imperceptible	An effect capable of measurement but without noticeable consequences.
Slight	An effect which causes noticeable changes in the character of the environment
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging trends
Profound	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

8.4.6.3 Significance of Effect

24. Depending on the type of effect and the sensitivities of the important ecological feature, an effect may be assessed as 'significant'. The process used to identify significant effects for Ecological Impact Assessment is less rigidly defined than for other environmental disciplines, and is described as follows in the CIEEM guidelines: "*A significant effect is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project*". "*For the purpose of EcIA, a 'significant negative effect' is an effect that undermines biodiversity conservation objectives for 'Important Ecological Features', or for biodiversity in general*". Where significant effects are identified, measures will be taken to avoid, minimise or compensate for effects.

8.4.7 Assessment Limitations

25. All surveys were carried out during the optimal seasons for relevant flora and fauna, so the assessment does not have any limitations or information gaps.

8.4.8 Embedded Mitigation

26. Habitats and peat were identified as important ecological features at an early stage in the planning of the Development, and preliminary surveys were carried out prior to the development of the initial layout. The ecologist subsequently provided input for each iteration of the design, proposing modifications to the layout to minimise effects on these features. The design iterations and their rationale are set out in **Chapter 4: Site Selection and Design**. Where possible, the layout was adjusted to

[9] Collins, J. (ed.) (2016). *Bat Surveys For Professional Ecologists: Good Practice Guidelines* (3rd edition). The Bat Conservation Trust, London.
[10] Hundt, L. (ed.) (2012). *Bat Surveys: Good Practice Guidelines document.* (2nd edition). The Bat Conservation Trust, London.
[11] Scottish Natural Heritage (in association with Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter and the Bat Conservation Trust), 2019. *Bats and onshore wind turbines: survey, assessment and mitigation*. Available online at https://www.nature.scot/professional-advice/planning-and-development/renewable-energy-development.

make use of existing access roads and hardstands of the Operational Corkey Windfarm. This approach has minimised the impact of the Development on habitats and peat.

27. A range of hydrological mitigation measures have been proposed for the initial decommissioning / construction phases of the Development, which are described in the Outline Decommissioning / Construction Environmental Management Plan (DCEMP, **Technical Appendix A3.1**) and the Outline Water Construction and Environmental Plan (Outline WCEMP, **Technical Appendix A7.2** this will form an appendix to the Outline DCEMP however for ease of reference has been included as an appendix to this chapter for the purposes of the ES). They include established and effective good practice methods, which can be secured via the use of an appropriately worded planning condition. There is sufficient confidence in the effectiveness of the measures for them to be treated as an inherent part of the Development for the purposes of this assessment, so they are considered to be embedded mitigation.

28. The hydrological mitigation measures set out in the Outline DCEMP and Outline WCEMP can be summarised as follows:

- Buffer zones for watercourses, and restrictions on works within these zones;
- Measures for the control of exposed sediments;
- A system of interceptor drains and settlement ponds to control suspended sediments;
- Procedures for the storage of cement (and related materials), for the pouring of concrete, and the cleaning of equipment;
- Procedures for the storage of hydrocarbons, for the refuelling of vehicles, and for responses to any spills; and
- Monitoring and maintenance of the implementation of these measures.

29. The system of interceptor drains and settlement ponds will remain in place during the operation of the Development, and will be monitored and maintained as required.

30. Although these hydrological best practice measures are described as embedded mitigation throughout the ES, it is important to note that embedded mitigation cannot be considered during the Appropriate Assessment process. Therefore, in the Habitat Regulations Assessment in **Technical Appendix A8.2**, the measures outlined in the Outline DCEMP and Outline WCEMP are not taken into account at the screening stage.

8.5 Baseline Description

8.5.1 Environmental Setting

31. The Operational Corkey Windfarm is situated on the crest of Corkey Hill, to the north-east of Clough Mills in County Antrim. The Site includes the Operational Corkey Windfarm and additional lands on the northern and western slopes of the hill. The landscape is characterised by moorland and heathland, while the lower sections of the western slopes consist of improved agricultural grasslands.

32. The underlying bedrock geology is basalt, which is a poor aquifer. Superficial geology is predominantly peat, with localised pockets of glacial till. The Site is in the catchments of the Killagan Water and Cloghmills Water (part of the Neagh-Bann River Basin District) and the Bush River (part of the North Eastern River Basin District). The Killagan Water is classified as having moderate overall status while the Bush River and Cloghmills Water are classified as having good overall status. Further details are provided in **Chapter 7: Hydrology, Hydrogeology, Geology, Soils and Peat.**

8.5.2 Designated Sites

33. The Site is not within or adjacent to any sites that are designated for nature conservation. Details of Natura 2000 sites (Special Areas of Conservation (SACs) and SPAs) within 15 km of the centre of the Site are provided in **Figure 8.1** and **Table 8.4.** Sites of national importance (ASSIs and NNRs) are presented in **Figure 8.2** and **Table 8.5**. Potential pathways (e.g., hydrological connections) for indirect effects on each designated site are discussed in the tables.

Table 8.4: Designated Sites of European Importance (Natura 2000 sites) within 15 km of the Site

Site name	Distance	Qualifying Interests	Potential pathways for effects
Antrim Hills SPA	0.8 km north-east	**Special Conservation Interests:** • Hen harrier (breeding) • Merlin (breeding)	There is potential for the Site to be within the flight range of birds from the SPA (refer to **Chapter 9: Ornithology**).
Main Valley Bogs SAC	5.2 km west	**Annex I Habitats:** • Active raised bogs	None
Garron Plateau SAC	8 km south-east	**Annex I Habitats:** • Blanket bogs • Alkaline fens • Oligotrophic standing waters • Natural dystrophic lakes and ponds • Northern Atlantic wet heaths with *Erica tetralix* • Transition mires and quaking bogs **Annex II Species:** • Marsh saxifrage (*Saxifraga hirculus)*	None
Breen Wood SAC	10 km north	**Annex I Habitats:** • Old sessile oak woodlands • Bog woodland **Annex II Species:** • None	None
Lough Neagh & Lough Beg SPA	Approx. 40 km downstream via the River Main	**Special Conservation Interests:** • Whooper swan (wintering) • Bewick's swan (wintering) • Golden Plover (wintering) • Goldeneye (wintering) • Pochard (wintering) • Scaup (wintering) • Tufted duck (wintering) • Great-crested grebe (breeding, passage migrant, wintering) • Common tern (breeding) • Black-headed gull (breeding)	Distant indirect hydrological connection via the Killagan Water and River Main

Table 8.5: Designated Sites of National Importance (ASSIs and NNRs) within 15 km of the Site

Site name	Distance	Reasons for designation	Potential pathways for effects
Slieveanorra and Croaghan ASSI	2.8 km north-east	Blanket bog, montane heath, hen harrier and merlin	There is potential for the Site to be within the flight range of birds from the ASSI (refer to **Chapter 9: Ornithology**).
Slieveanorra NNR	4.2 km north-east	Peatlands	None
Glarryford ASSI	5.1 km south-west	Glacial deposits including eskers and hummocks	None
Dunloy Bog ASSI	5.2 km south-west	Lowland raised bog	None
Frosses Bog ASSI	6.3 km south-west	Lowland raised bog	None
Caldanagh Bog ASSI	6.6 km west	Lowland raised bog	None
Ballymacaldrack ASSI	8.5 km south-west	Purple moor-grass and rush pastures	None
Craig ASSI	10.5 km west	Purple moor-grass and rush pastures	None
Garron Plateau ASSI	8 km south-east	Blanket bog, fens, dystrophic lakes, oligotrophic lakes, wet heath, dry heath	None
Rathsherry ASSI	9.5 km south	Purple moor-grass and rush pastures	None
Glenballyemon River ASSI	8.1 km east	Upland river and waterfalls	None
Tievebulliagh ASSI	8 km north-east	Tertiary igneous geology	None
Glenariff ASSI, NNR	10.1 km east	Ash woodland and upland rivers with waterfalls	None

Site name	Distance	Reasons for designation	Potential pathways for effects
Breen Oakwood ASSI, NNR	10.5 km north	Oak woodlands, wet woodlands	None
Capecastle ASSI	13 km north	Geology: cretaceous stratigraphy	None

34. Potential effects on the qualifying interests of the Antrim Hills SPA and the Slieveanorra and Croaghan ASSI are addressed in **Chapter 9: Ornithology**, and potential effects on water quality in the River Main and its tributaries are addressed in **Chapter 7: Hydrology, Hydrogeology, Geology, Soils and Peat**. Based on these specialist reports, potential effects on Natura 2000 sites are addressed in **Technical Appendix A8.2: Habitats Regulations Assessment**.

35. Although there are also distant hydrological connections to other designated sites associated with Lough Neagh and the River Bann, any measures taken to avoid or minimise effects on the River Main would also avoid or minimise effects on the other downstream designated sites. Therefore, detailed assessment of the other downstream designated sites is considered unnecessary.

36. Maps showing the locations of Sites of Local Nature Conservation Importance (SLNCIs) were obtained from Causeway Coast and Glens Borough Council, but no relevant sites were identified within the 5 km Study Area.

8.5.3 Desktop records of flora and fauna

37. Prior records of flora and fauna in the vicinity of the Site were obtained from the Centre for Environmental Data and Recording (hosted by the National Museum of Northern Ireland) and the National Biodiversity Network. The former are from government databases of rare and protected species, and the latter are additional records from a range of verified sources (e.g., BSBI tetrad data for Ireland). The Site is within the 10 km grid-square D12. All records were filtered for protected and priority species, and edited lists are provided in **Sections 8.5.4 and 8.5.5**.

38. It is important to note that these records do not provide a definitive confirmation of the presence or absence of any species in the Study Area. Most records are from national distribution atlases that are based on representative sampling at a few randomised sites, so the true distribution of these species (and also species not included on this list) may be much higher than recorded. Conversely, the distribution of some species may have decreased since the latest record, and some may have become locally extinct. As such, the lists are provided for reference purposes only, and should be interpreted with care.

8.5.4 Habitats and Flora

39. A map of habitats within the Site Boundary (at the time of scoping) is provided in **Figure 8.3**, and descriptions of each habitat are provided below. Particular attention has been paid to habitats that would qualify as 'active peat', as outlined in **Section 8.4.3**. Detailed habitat and peat assessments at proposed turbine and infrastructure locations are presented in **Technical Appendix A8.1.**

8.5.4.1 Bog and Heath

8.5.4.1.1 Blanket Bog (E1.6.1)

40. An area of intact blanket bog habitat measuring approximately 17 ha is located on the plateau in the east of the Study Area. It is fragmented by drainage channels of 0.5 to 1 m depth across the eastern section of the peat expanse, and by existing tracks of the Operational Corkey Windfarm. However, with these exceptions, the habitat is considered to be hydrologically-intact, and to be actively peat forming. It has abundant ling heather *Calluna vulgaris*, hare's-tail cottongrass *Eriophorum vaginatum*, common cottongrass *Eriophorum angustifolium*, with frequent deergrass *Trichophorum germanicum*, occasional Purple moor-grass *Molinia caerulea* and cross-leaved heath *Erica tetralix*, and rare bog asphodel *Narthecium ossifragum*. The heather is approximately 10 – 20 cm in height, and does not form a closed canopy; this vegetation structure is considered to be indicative of intact blanket bog. The bryophyte layer is dominated by *Sphagnum capillifolium*, with frequent to occasional *S. papillosum*, *S. subnitens*, *S. cuspidatum, Polytrichum commune* and *Odontoschisma sphagni*. Dry areas on hummocks have abundant *Hypnum jutlandicum*, and frequent to occasional *Hylocomium splendens*, *Racomitrium lanuginosum*, *Pleurozium schreberi*, *Dicranum scoparium* and *Polytrichum juniperinum*. Under the NVC classification system for mires it is considered most closely matched to M19a: *Calluna vulgaris – Eriophorum vaginatum* blanket mire: *Erica tetralix* sub-community.

41. A separate area of intact blanket bog measuring 4 ha is found on sloping ground in the north of the Site. It is dominated by ling heather, with abundant hare's-tail cottongrass, frequent cross-leaved heath, and occasional crowberry *Empetrum nigrum* subsp. *nigrum* and common cottongrass. As above, the heather is approximately 10 to 20 cm in height, and does not form a closed canopy. The bryophyte layer is dominated by *Sphagnum capillifolium*, with frequent *S. papillosum*, and occasional *Hypnum cupressiforme* and *Rhytidiadelphus loreus*. As above, this habitat was most-closely matched to the NVC habitat M19a: *Calluna vulgaris – Eriophorum vaginatum* blanket mire.

42. Blanket bog is listed on Annex I of the EC Habitats Directive, and is a Northern Ireland Priority Habitat. It is located on deep peat, and meets the criteria for 'active peat'. However, as the area of habitat within the Site is relatively small, fragmented and within a broader expanse of degraded habitat, it is not considered to be of international or national value, and would not warrant designation. Larger expanses of upland blanket bog can be found throughout the Antrim Hills to the north and east of the Site. Therefore, both patches of intact blanket bog are considered to be of County ecological value.

8.5.4.1.2 Wet modified bog (E1.7)

43. Much of the blanket bog on Corkey Hill has been degraded by drainage, peat harvesting and/or heather removal. In some locations, this has caused erosion of the peat surface, further altering the micro-topography of the peat. These activities are likely to have stopped the peat formation process over the majority of the area, although hydrological conditions for peat formation may remain in some low-lying areas.

44. In the centre of the Study Area there is approximately 22 ha of relatively deep peat (approximately 1 m on average) with considerable evidence of modification, including several artificial drainage channels of 1 to 2 m depth and 2 to 3 m width, large patches of bare peat, and an uneven micro-topography. Many of the drier areas are characterised by dense shrub growth, with dominant ling heather, frequent crowberry, cross-leaved heath, hare's-tail cottongrass, common cottongrass and occasional bilberry *Vaccinium myrtillus* and bell heath *Erica cinerea*. *Sphagnum* mosses are occasional and patchy, and are usually only found in flushed areas. The heather is approximately 20 to 30 cm in height, and often forms a closed canopy, which often indicates that the habitat is desiccated and that the peat has started to mineralise. On the 'saddle' area between the two peaks, all vegetation has been cleared within the previous five years, and the peat surface has been recolonised by pioneer vegetation, including dominant common cottongrass, occasional ling heather and hare's-tail cottongrass, with no bryophyte coverage.

45. These habitats are now highly degraded. The modification of peatland often causes changes in hydrology, pH and nutrient levels, which in turn can alter vegetation communities. As a result, these habitats would not qualify as European Annex I habitat, although they are still considered to be NI Priority Habitat. In their current state they are considered to be of Local ecological value.

8.5.4.1.3 Dry modified bog (E1.8)

46. Approximately 0.6 ha of the modified bog in the north of the Study Area has been drastically modified by peat cutting and erosion, resulting in significant disruption of the natural hydrological regime. The topography is very uneven, with standing 'hags' of desiccated peat of up to 1 to 2 m in height, divided by deep channels in which the peat has eroded down to the underlying subsoil. All remaining peat within the hag is dry and mineralised, resulting in the loss of wetland species and excessive growth of ericoids, forming a type of dry heath vegetation. These areas are dominated by ling heather of approximately 50 to 70 cm height, with frequent bell heather, bilberry and cross-leaved heath, but little other vegetation. *Hypnum jutlandicum* is dominant in the bryophyte layer, with occasional heathland mosses such as *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Pleurozium schreberi*. The low-lying areas typically have large patches of bare peat and exposed subsoil, with some patches of deergrass, common cottongrass, and *Sphagnum cuspidatum* in wetter areas.

47. As noted above, this habitat has been highly modified and has lost the characteristic vegetation communities of blanket bog. It would not qualify as a European Annex I habitat, although it is still considered to be NI Priority Habitat. It has been drained for a long period of time and it is unlikely that it could revert to blanket bog, as the climax community is a form of dry dwarf shrub heath. On this basis, it is considered to be of Local ecological value.

8.5.4.1.4 Wet dwarf shrub heath (D2)

48. This habitat is found on the upper slopes of Corkey Hill, on areas with peat layers of approximately 0.5 m depth or less. At its upper extent it grades into blanket bog habitat, and at its lower extent (approximately 250 to 300 m above sea level) it grades into acid grassland habitat. The dominant species is ling heather, with frequent hare's-tail cottongrass, common cottongrass, deergrass, crowberry and occasional heath-rush *Juncus squarrosus*, cross-leaved heath, bell heather and carnation sedge *Carex panicea*, and rare tormentil *Potentilla erecta*. Purple moor-grass is locally-abundant, but occasional overall. The

bryophyte layer has frequent *Hypnum cupressiforme* and *Rhytidiadelphus loreus*, occasional *Rhytidiadelphus squarrosus* and *Sphagnum capillifolium*, and rare *S. subnitens* and *S. papillosum*.

49. Wet heath is listed on Annex I of the EC Habitats Directive (as 'northern Atlantic wet heaths with *Erica tetralix*'), and is an NI Priority Habitat. However, as it is common and widespread in surrounding upland areas, it is considered to be of Local ecological value.

8.5.4.2 Grassland

8.5.4.2.1 Acid grassland (B1)

50. This habitat is found on the upper slopes of Corkey Hill, typically between the 250 and 350 m contours. At its upper extent it grades into wet dwarf shrub heath, and at its lower extent into semi-improved grasslands, although some strips of acid grassland on the upper slopes also appear to have been improved. The sward is typically dominated by a combination of Yorkshire-fog *Holcus lanatus*, mat-grass *Nardus stricta* and sweet vernal-grass *Anthoxanthum odoratum*, with locally-abundant wavy hair-grass *Deschampsia flexuosa* and soft-rush *Juncus effusus*, particularly in low-lying areas. Heathland species are occasional, including ling heather, bell heather, deergrass and cottongrasses. The bryophyte layer is dominated by *Rhytidiadelphus squarrosus*, with occasional heathland species such as *Rhytidiadelphus loreus*, *Dicranum scoparium*, *Hylocomium splendens* and some small, isolated patches of *Sphagnum capillifolium*.

51. This habitat is relatively common in the surrounding landscape and is considered to be of Negligible value. 'Lowland dry acid grasslands' are an NI Priority Habitat, but the acid grasslands within the Site are upland and generally wet in character, so they do not meet the criteria of the NI Priority Habitat.

8.5.4.2.2 Improved grassland (B4)

52. Improved grasslands are found on the lower slopes of the hill, and used primarily for livestock grazing. The dominant species are Yorkshire-fog and sweet vernal-grass, with abundant perennial rye-grass *Lolium perenne* on the lower slopes. In addition, there is frequent creeping bent *Agrostis stolonifera*, common bent *Agrostis capillaris*, smooth meadow-grass *Poa pratensis* and rough meadow-grass *Poa trivialis*, and occasional annual meadow-grass *Poa annua*. Soft-rush is locally frequent. Forbs are unevenly distributed, with locally frequent patches of white clover *Trifolium repens*, common chickweed *Stellaria media*, creeping buttercup *Ranunculus repens*, and occasional creeping thistle *Cirsium arvense*, common mouse-ear *Cerastium fontanum* and cuckooflower *Cardamine pratense*. *Rhytidiadelphus squarrosus* is the dominant bryophyte throughout the sward.

53. This habitat is very common in the surrounding landscape, is not an NI Priority Habitat, so it is considered to be of Negligible ecological value.

8.5.4.3 Woodland and scrub

8.5.4.3.1 Plantation woodland (A1)

54. A small conifer plantation measuring approximately 2 ha is located on the lower slopes of the hill in the west of the Study Area (refer to **Figure 8.3)**. It is dominated by sitka spruce *Picea sitchensis*, with little other vegetation of note. Sitka spruce is not native to Ireland, is not an NI Priority Habitat, and the habitat is small and entirely isolated from any other woodlands in the area, so it is considered to be of Negligible ecological value.

8.5.4.3.2 Scrub (A2)

55. This habitat is found in the valley of a small stream in the west of the Site. It is dominated by dense gorse *Ulex europaeus* with occasional willows *Salix* sp. and downy birch *Betula pubescens* in sheltered areas. There is evidence of badger and other mammals using the scrub as a linear habitat corridor along the stream. Although it is of little botanical value and is not an NI Priority Habitat, it has secondary value as a habitat for badgers and other protected and priority fauna, so it is considered to be of Local ecological value.

8.5.4.4 Disturbed land

8.5.4.4.1 Exposed bedrock (J4)

56. Peat has been excavated from an area in the east of the Study Area, leaving approximately 1 ha of exposed bedrock and subsoil. The bedrock is entirely unvegetated, and surrounded by bare peat and dry modified bog habitat. It has little or no value for flora or fauna, is not an NI Priority Habitat, and is considered to be of Negligible ecological value.

8.5.4.5 Open water

8.5.4.5.1 Running water (G2)

57. A number of small streams arise in the Site and flow downhill to join the River Main. Other than some soft-rush, no aquatic vegetation was observed in the streams. All rivers are NI Priority Habitats, and the streams have secondary value as habitat for fisheries (as outlined in **Section 8.5.5.7**), so all streams are therefore considered to be important ecological features.

8.5.4.6 Rare or protected flora

58. A list of the protected and priority species obtained from desktop data sources is presented in **Table 8.6**. None of these species were recorded during field surveys.

Table 8.6: Desktop records or rare and protected plants

Latin Name	Common Name	Latest record	Approximate Location	Legal Status	Priority Species?
Bartramia ithyphylla	Straight-leaved Apple-moss	1964	Antrim vice-county		Yes
Coeloglossum viride	Frog Orchid	1875	Glenariff		Yes
Cryptogramma crispa	Parsley Fern	1985	Slieveanorra Forest		Yes
Gentianella campestris	Field Gentian	1979	Glendun		Yes
Melampyrum sylvaticum	Small Cow-Wheat	1906	Glenariff	Wildlife Order 1985	Yes
Primula vulgaris	Primrose	2005	Lavin Plantations	Wildlife Order 1985	
Pseudorchis albida	Small-White Orchid	1895	Glenariff	Wildlife Order 1985	Yes
Salix myrsinifolia	Dark-Leaved Willow	1989	Glenbush, Bush River		Yes

8.5.4.7 Invasive species

59. No invasive plant species were encountered in the Site or its surroundings.

8.5.4.8 Active peat

60. The proposed location of Turbine 1 is on level ground in an area of cutover / eroded peat adjacent to an existing hardstanding platform. The habitat forms a mosaic of low-lying wet areas from which the peat has eroded, and 'hags' of deeper peat that are unable to retain water. The quadrat location (at the centre point of the proposed turbine) was on peat of 1.2 m depth, but was adjacent to a vertical peat bank and showed clear evidence of desiccation, as indicated by the cover of *Hypnum jutlandicum* and *Erica cinerea* (species that are indicative of dry heath habitat), and the absence of *Sphagnum* mosses. It was not considered to be active peat, because of the low cover of peat-forming species, the presence of some atypical species, and its severely modified hydrology (refer to **Table 1** of **Technical Appendix A8.1**). Most of the proposed hardstand platform for Turbine 1 will be located on an existing hardstand, with overlap onto adjacent highly-modified areas around the edges of the platform. Overall, it is concluded that the majority of habitat at the proposed turbine location (including all associated infrastructure) is not active peat.

61. The proposed location of Turbine 2 is on moderately-sloping ground in an area of modified blanket bog, which has evidence of erosion in most areas. Peat depths were between 0.5 m and 1 m over most of this area, with occasional records of up to 2 m. Some of the wetter areas meet the criteria for active peat, and NIEA-NED at a site meeting in February 2019 asked that this be further investigated, so detailed peat assessments were carried out at this area, comprising 35 randomly-located quadrats in the footprint of the turbine foundation, hardstanding platform and access road. The results are presented in full in **Table 2** of **Technical Appendix A8.1**, and a summary is provided below. Eleven quadrats met the criteria for active peat, which is 31% of the total. Six of these were in flushed areas, as indicated by the presence of *Sphagnum cuspidatum*, *S. denticulatum. S. palustre* and *S. fallax*. Some of these flushed areas are a natural part of blanket bog micro-topography, but most were located on shallow peat in highly-modified habitat. Only six of the plots classified as active peat had the characteristics of intact blanket bog, i.e. characteristic vegetation, deep peat and intact hydrology. Overall, it is concluded that the majority of habitat at the proposed turbine location (including all associated infrastructure) is not active peat.

62. The proposed location of Turbine 3 is on moderately-sloping ground similar in character to the proposed location of Turbine 2. Peat depths were between 0.5 m and 1 m, and there were signs of erosion throughout the area. NIEA-NED at a site meeting in February 2019 also asked that this area be further investigated, so detailed peat assessments were carried out at this area, comprising 32 randomly-located quadrats in the footprint of the hardstanding platform and access road. The results are presented in full in **Table 3** of **Technical Appendix A8.1**. In summary, eight quadrats met the criteria for active peat, which is 25% of the total. Six of the eight quadrats in active peat were in flushed areas on shallow peat (0.3 m – 0.5 m), and showed signs of enrichment by runoff from eroded mineral soils and an existing hardstand platform. Only two of the plots classified as active peat had the characteristics of intact blanket bog. Therefore, it is concluded that the majority of habitat at the proposed turbine location (including all associated infrastructure) is not active peat.

63. The proposed location of Turbine 4 is on steeply-sloping ground on the western slope of Corkey hill. Peat depth is consistently less than 0.5 m throughout this area (refer to **Figure 8.4**), and the habitat is considered to be transitional between wet heath and wet acid grassland. Two quadrats were taken, one at the proposed turbine location, and second at the proposed hardstand. Peat depth ranged from 0.2 – 0.3 m, peat-forming species (*Sphagnum* and *Eriophorum* spp) had very low cover, and a range of atypical species were present, including *Erica cinerea*, *Nardus stricta* and *Juncus squarrosus* (refer to **Table 1** of **Technical Appendix A8.1**). Therefore, it is clear that the proposed turbine location (including all associated infrastructure) is not on active peat.

64. The proposed location of Turbine 5 is also on moderately-sloping ground on the western slope of Corkey Hill. Peat depth is between 0.5 m and 1 m (refer to **Figure 8.4**), and the habitat may formerly have been wet heath, but it has been modified for agricultural purposes. It is part of a large field that is used as a pasture for sheep grazing at moderate intensity. Two quadrats were taken, one at the proposed turbine location, and second at the proposed hardstand. Peat depth ranged from 0.2 – 0.4 m, peat-forming species (*Sphagnum* and *Eriophorum* spp) were absent or had very low cover, and a range of atypical species were present, including *Erica cinerea*, *Deschampsia flexuosa* and *Anthoxanthum odoratum* (refer to **Table 1** of **Technical Appendix A7.1**). Therefore, it is clear that the proposed turbine location (including all associated infrastructure) is not on active peat.

65. Where possible, the layout of the Development has been adapted to re-use existing access tracks and hardstands of the Operational Corkey Windfarm. Access to Turbines 1, 2 and 3 will be via existing tracks and hardstands, and new infrastructure has been designed to avoid impacts on active peat, as outlined above. In most cases the existing access tracks can be re-used without major modification, but there are two locations at which tight corners in the existing roads will need to be widened in order to provide turning circles for modern turbine delivery equipment, as shown in **Figure 3.3.2**. Both of these areas will be on active peat, but the area of effect has been minimised (refer to **Table 8.10**), and their extent is considered to be negligible in the context of the surrounding habitat.

66. There are no existing access tracks that would serve the proposed locations for Turbines 4 and 5, so new sections of access tracks will be constructed. They will cross an area of shallow peat in wet heath / acid grassland, which is very similar in character to the habitat described at Turbines 4 and 5 above, so it will not affect any active peat. All other aspects of the proposed Development infrastructure (including the control building, temporary construction compounds, and track re-alignments at the Site entrance) will be on non-peatland habitats.

8.5.5 Protected / Priority Fauna

8.5.5.1 Badgers

67. Four badger setts were encountered during habitat surveys. The location of the setts cannot be made public in this document because badgers are vulnerable to persecution, but all setts are located on the lower slopes of the hill more than 100 m from any proposed Development infrastructure. Two appeared to be main setts, one to be a subsidiary sett and one an annex sett. All appeared to be recently active, and field signs of badgers - including latrines, hairs, prints and tracks - were found elsewhere in the Site, including in peatland areas on the crest of Corkey Hill. Overall, the Site is considered to be of Local importance for badgers, and to contain one or more breeding setts.

8.5.5.2 Bats

68. The only species recorded in significant numbers were Leisler's bat (51% of all bat records) and common pipistrelle (39%); all other species had negligible activity. Although there were some nights of moderate and high activity for Leisler's bats and common pipistrelles, the vast majority (90%) of nights had negligible activity (i.e., less than 10 bat passes), and the nights with moderate or high activity (i.e. greater than 50 bat passes) comprised less than 1% percent of the study period. This is described in detail in **Technical Appendix A8.3**.

69. On this basis, it is concluded that the Study Area is not used by any bat species on a regular basis as a feeding area or commuting route, and thus that it has Negligible value for bats. Nonetheless, it is noted that all bat species receive strict protection under the *Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995* (S.I. 1995/380, as amended).

8.5.5.3 Irish hare

70. One Irish hare *Lepus timidus* subsp. *hibernicus* was observed on an existing access track in the Operational Corkey Windfarm in May 2017. This species is common and widespread in Northern Ireland and is currently listed as 'least concern' in the all-Ireland red data book for terrestrial mammals (Marnell et al. 2009). It is a Northern Ireland Priority Species, but is not legally protected. The population within the Site is considered to be very small, and of Negligible ecological value.

8.5.5.4 Other protected mammals

71. No other protected mammals were recorded using the Study Area during the surveys. Desktop records of other protected and priority mammal species from the surrounding 10km square are presented in **Table 8.7**.

Table 8.7: Desktop records of rare and protected mammals

Latin Name	Common Name	Latest record	Approximate Location	Legal Status	Priority Species?
Lutra lutra	Otter	2001	Bush River	HR, WO	NI PS
Martes martes	Pine Marten	2007	Slieveanorra Forest	HR, WO	NI PS
Sciurus vulgaris	Red Squirrel	2007	Slieveanorra Forest	WO	NI PS

72. ** Codes used in the 'legal status' column are as follows: HR - species that are protected under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995; WO - species that are protected under the Wildlife (Northern Ireland) Order 1985*

73. Otters have been recorded at some of the larger rivers and lakes in the surrounding area. Although the small streams within the Site could potentially be used by otters, it is highly unlikely that they could provide a sufficient quantity of prey to sustain even a single individual. No potential otter holts were identified during field surveys. Therefore, the Site is highly unlikely to be used by otters on a regular basis.

74. Red squirrels and pine martens are primarily associated with woodland / forest habitats. They have been recorded in the nearby Slieveanorra Forest, but the only suitable habitat within the Site is the 2 ha patch of conifer plantation on the western slope. This plantation is small and isolated, and would not be sufficiently large to support either species. Therefore, neither species is likely to use the Site on a regular basis.

75. On this basis, the Site is considered to be of negligible ecological value for all of these species.

8.5.5.5 Reptiles and Amphibians

76. Common frogs were observed in the bog and heath habitats. This species does not receive legal protection, and is not a Northern Ireland Priority Species. Smooth newts have been recorded in the surrounding 10 km square (CEDaR records), but they were not recorded within the Site. This species is protected under the Wildlife (NI) Order 1985, but is not a Northern Ireland Priority Species. Small ponds were observed in the peat workings in the east of the Site, but during periods of dry weather in summer months all ponds were observed to dry out, so they are considered unlikely to provide suitable breeding habitat for newts or frogs. On this basis, newt surveys were scoped out of this assessment.

77. Upland bogs and heathland are a preferred habitat for common lizards, and it is possible that some may be present in the Site at low densities. However, considering that the Study Area was visited on 12 occasions between March and June (which encompasses a key period of lizard activity), and that more than 50 km was travelled during walkover surveys, it is notable that no lizards were recorded. On this basis, it is expected that, if present, lizards may occupy the Study Area at very low densities, and thus would not be likely to receive significant effects from the Development. On this basis, lizard surveys were scoped out of this assessment. However, some generic mitigation measures are provided in **Section 8.7**, as requested by the NIEA (Natural Environment Division).

8.5.5.6 Terrestrial Invertebrates

78. A search for the larval food plant (devil's-bit scabious *Succisa pratensis*) of the marsh fritillary butterfly was undertaken during the habitat surveys, but no larval food plants were recorded. Therefore, marsh fritillary surveys were scoped out of this assessment.

8.5.5.7 Fisheries

The Development is located in the Killagan Water sub-catchment of the River Main. Fisheries assessments were carried out on three streams that arise in the Site and flow downstream into the Killagan Water. All three small streams were shallow with moderate flows, and had a substratum comprising mainly cobble and boulder with some patches of smooth bedrock. The pH in all streams was slightly alkaline, with moderate conductivity, satisfactory dissolved oxygen levels and very low turbidity readings. Based on aquatic invertebrate surveys, all three sites were classified as having HIGH WFD-based water body status, both for the numbers of taxa and average scores per taxon.

A juvenile fish stock survey of the streams within the Site and the downstream reach of the Killagan Water was carried out in September and October 2017. Juvenile brown trout were recorded all streams, generally within an abundance index of absent or poor, but with a good score at one location, and excellent stocks downstream in the Killagan Water. Atlantic salmon are known to be present downstream in the River Main, but no juvenile salmon were recorded during the electrofishing survey, and it was considered unlikely that they would use the three small streams associated with the Site.

The sensitivity of the Killagan Water was assessed as Medium due to the presence of Brown trout throughout. However, salmon are present in the lower reach adjacent to the River Main, so sensitivity in this watercourse is 'Medium (High)'. Further details are provided in **Technical Appendix A8.4: Fisheries Report**.

8.5.6 Selection of Important Ecological Features

79. Summaries of the ecological valuation and legal / conservation status of habitats and fauna within the Study Area are outlined in **Tables 8.8** and **8.9** respectively. For the purposes of this impact assessment, any features that are Northern Ireland Priority Habitats/Species, or that are valued at Local value or higher, are considered to be 'important ecological features'.

Table 8.8: Identification of key ecological receptors: designated sites and habitats

Site name	Total Area (ha)	Ecological Value	NI Priority Habitat	Important Ecological Feature?
Natura 2000 sites		International		Yes
ASSIs		National		Yes
SLNCIs		County / Local		No
Blanket bog (E1.6.1)	20.8	County	Yes	Yes
Wet modified bog (E1.7)	24.6	Local	Yes	Yes
Dry modified bog (E1.8)	2.3	Local	Yes	Yes
Wet dwarf shrub heath (D2)	73.1	Local	Yes	Yes
Running water (G1)	2km	Local	Yes	Yes
Gorse scrub (A2)	1.5	Local		Yes
Acid grassland (B1)	57.3	Local		No
Improved grassland (B4)	127.4	Negligible		No
Plantation woodland (A1)	2.2	Negligible		No
Exposed bedrock (J4)	2.51	Negligible		No
Total area	**333.8ha**			

Table 8.9 Identification of key ecological receptors: flora and fauna species

Site name	Ecological Value	Legal Status*	NI Priority Species	Important Ecological Feature?
Badger	Local	WO		Yes
Bats	Negligible	WO	Yes (3 spp.)	Yes
Fisheries (Killagan Water)	Medium sensitivity	FA	Yes	Yes
Fisheries (River Main)	Medium (high) sensitivity	FA	Yes	Yes
Irish hare	Local		Yes	No
Otter	Negligible	HR, WO	Yes	No
Red squirrel	Negligible	WO	Yes	No
Pine marten	Negligible	HR, WO	Yes	No
Other mammals	Negligible			No
Smooth newt	District	WO		No
Common lizard	Negligible	WO	Yes	No
Common frog	Local (low)			No
Marsh fritillary	Negligible	WO	Yes	No
Other invertebrates	Local (low)			No
Rare and protected flora	Various	WO	Yes	No

80. ** Codes used in the 'legal status' column are as follows: HR - species that are protected under the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995; WO - species that are protected under the Wildlife (Northern Ireland) Order 1985; FA – fish species protected under the Fisheries Act (Northern Ireland) 1966.*

8.5.7 Future baseline scenario

81. There are not expected to be any changes to the condition of the habitats, flora and fauna of the Study Area from the baseline reported in this section.

8.6 Assessment of Potential Effects

8.6.1 Decommissioning and Construction Phase

8.6.1.1 Designated sites

82. The Site is not within or adjacent to any designated sites, so there is no risk of direct effects on any ecological designated sites. Potential direct effects on the qualifying interests of the Antrim Hills SPA and the Slieveanorra and Croaghan ASSI are addressed in **Chapter 9: Ornithology**.

83. There is a distant hydrological pathway between the Site and the 'Lough Neagh and Lough Beg' SPA via approximately 40 km of the Killagan Water and River Main. If the construction phase of the Development caused the release of significant quantities of pollutants (e.g., suspended sediments or hydrocarbons) into the River Main catchment, they could potentially be carried downstream into the Lough Neagh and Lough Beg SPA. In practice, it is highly unlikely that pollutants could reach the SPA in high enough quantities to have a significant effect (even without consideration of mitigation measures), but for the purposes of this assessment a worst-case scenario has considered, for which it is assumed that it could cause localised, slight negative effects on the SPA, and/or could contribute to diffuse pollution in the lake. This is discussed in detail in **Technical Appendix A8.2: Habitats Regulations Assessment**.

84. There is no risk of effects on any other designated sites.

8.6.1.2 Habitats

85. Any construction works on undeveloped land will result in habitat loss, but the significance of ecological effects will vary in relation to the value of the habitats that will be affected, and whether they are Important Ecological Features. In recognition of this, the layout of turbines and access roads was designed in order to avoid or minimise effects on habitats of high ecological value (mitigation by design), particularly peatland areas. Habitat and peat surveys were carried out at an early stage in the

planning of the Development, and the ecologist provided input for each revision of the layout, proposing modifications to minimise effects on important habitats.

86. Based on the final layout, an approximate calculation of the direct effects on habitats from each component of the Development is listed in **Table 8.10**. A summary of the total effects on each habitat type is presented in **Table 8.11**, including an indication of the percentage loss of each habitat type within the Site Boundary (at the time of scoping). These figures are provided only for informative purposes; they have been calculated using GIS software and are approximate.

87. The calculations in **Table 8.10** exclude the positive effects that will result from the measures outlined in the Draft Habitat Management Plan in **Technical Appendix 3.2**. This will include the restoration of blanket bog in the vicinity of some redundant access tracks and hardstanding areas, the blocking of artificial drainage ditches, re-profiling of highly-eroded peat, and monitoring vegetation re-establishment. These habitat improvements are not included in this table.

88. **Table 8.10. Direct effects on habitats within the footprint of the Development**

Component	Subdivision	Habitat type	Area affected (m^2)	Important Ecological Feature?
T1	Turbine and hardstand	Wet modified bog Existing hardstand Blanket bog	2,200 1,500 750	Y Y
	Roads: Site entrance to T1	Existing tracks	3,300	
	Turning arcs at bends south of T1	Blanket bog	500	Y
T2	Turbine and hardstand	Wet modified bog	4,500	Y
	Roads: T1 to T2	Existing tracks Wet modified bog	4,350 600	 Y
T3	Turbine and hardstand	Wet heath Wet modified bog	4,300 500	Y
	Roads: T2 to T3	Existing tracks Wet modified bog	2,000 300	 Y
T4	Turbine and hardstand	Acid grassland Wet heath	3,700 800	 Y
	Roads: T4 to T5	Wet heath Acid grassland	1,000 300	Y
T5	Turbine and hardstand	Wet heath	4,500	Y
	Roads: Main access track to T5	Acid grassland	350	
Compound to contain substation, control building and energy storage area		Improved agricultural grassland	1,925	
Temporary Construction Compounds		Made ground Improved agricultural grassland	2,500 12,750	
New access track		Improved agricultural grassland	11,700	
		Total	**64,325**	

Table 8.11. Cumulative effects on each habitat type, including an indication of the habitat loss within the landholding (representing a local context)

Habitat type	Total area affected (m^2)	Total habitat area	Percentage loss	Ecological Value
Blanket bog	1,250	207,816	0.6%	County
Wet modified bog	8,100	246,163	3.3%	Local
Wet heath	10,600	731,140	1.4%	Local
Acid grassland	4,350	573,072	0.7%	Negligible
Improved agricultural grassland	26,400	1,274,737	2.0%	Negligible
Existing road / surface	13,650	28,774	47.4%	Negligible

89. In summary, there will be permanent, unavoidable effects on 0.13 ha of blanket bog, 0.81 ha of wet modified bog and 1.06 ha of wet heath. All three habitats are Northern Ireland Priority Habitats. All other habitats within the Study Area are of Negligible ecological value, or will not be affected by the Development.

90. It is noted that the losses of blanket bog, wet modified bog and wet heath would be 0.6%, 3.3% and 1.4% of the total extent of each habitat within the Study Area. On this basis, the magnitude of effect is considered to be imperceptible (capable of measurement, but without noticeable consequences) as outlined in Section 8.4.6.2 of this document. In accordance with Section 8.4.6.3, the loss of these habitats would not have a significant effect at a local context, and would be considered 'not significant' in terms of the EIA Regulations.

91. It is also noted that 9.41 ha of degraded peatland habitat will be restored and protected as part of the Development, as outlined in **Technical Appendix A3.2: Draft Habitat Management Plan** (HMP). These measures are summarised as follows:

- Blocking man-made drainage channels over multiple areas, with a total area of effect of 5.86 ha;
- Removal of redundant tracks and hardstand platforms for existing Turbines 1 and 10 (combined surface area of 0.44 ha), and reinstating the area with peat;
- Monitoring vegetation re-establishment in areas of denuded peat (two areas with a total area of 2.36 ha); and
- Reprofiling of peat hags in 0.75 ha of highly-eroded dry modified bog.

92. Subject to the successful implementation of the HMP, the restoration measures will have a positive ecological effect on the degraded blanket bog habitat. It will take some years for these management measures to achieve their effect, but in the medium term the Development will have a slight positive effect on the local conservation value of these habitats, The area of restoration is significantly larger than the combined area of blanket bog, wet modified bog and wet heath that will directly affected during the initial decommissioning and construction phases.

93. Therefore, as the negative impacts on these habitats will be relatively small in extent, and the proposed habitat management measures are expected to increase the extent and condition of blanket bog, the Development will have a slight positive effect on Northern Ireland Priority Habitats in the medium term.

8.6.1.3 Active peat

94. Active peat assessments for all aspects of the proposed Development are described in Section 8.5.4.8. The proposed locations of Turbines 2 and 3, and associated infrastructure (including any new sections of access track), will be on wet modified bog and wet heath habitats that have localised pockets of active peat, but in both cases the majority of the affected area is not active peat. The proposed location of Turbine 1 will be on an area of wet modified bog, which has some localised pockets of active peat, but the extent of effect is reduced by the re-use of an existing hardstand platform. Some tight corners in the existing track will need to be widened into blanket bog (which is active peat at these locations) in order to accommodate the delivery vehicles for the larger turbine components, but the extent of impact is small. In all of these cases, the impacts on active peat are considered to be negligible. The proposed locations of Turbines 4 and 5 are not on active peat, nor are any other aspects of the proposed Development infrastructure.

95. As discussed in the previous section, the proposed habitat management measures will involve the restoration of approximately 9.41 ha of degraded blanket bog, with the aim of restoring most of these areas to intact blanket bog. These measures will reduce the rate of water loss from the bog, and thus will create wetter conditions at the peat surface, providing

favourable conditions for the re-establishment of active peat in areas that are currently inactive. As noted above, it will take some years for these management measures to achieve their effect, but in the short to medium term the development will have a slight positive effect on local status of active peat,

96. Therefore, as the loss of active peat during the initial decommissioning/construction works will be negligible at all locations, and the habitat management measures are expected to increase the extent of active peat in the Study Area, the Development will have a slight positive effect on active peat in the medium term.

8.6.1.4 Badgers

97. In the NIEA guidance document *Badgers and Development*[12] it is suggested that any groundworks within 25 m of a badger sett could cause significant disturbance, while some high-impact activities (e.g. pile-driving or blasting) could cause disturbance within 100 m of a sett. All of the badger setts are located more than 100 m from any works proposed for delivery of the Development, so there is no risk of direct or indirect effects on any setts.

98. There is evidence that badgers forage throughout the Site, including on the crest of Corkey Hill. They are nocturnal animals, and will not be present during daytime decommissioning/construction work. However, if any trenches or other excavations are left open at night, it is possible that a badger may enter the excavation and be unable to escape. This is unlikely to kill them, but would cause great agitation, and may lead to a conflict with construction personnel the following day. This could have a slight negative effect on the local badger group.

8.6.1.5 Bats

99. Site clearance works will involve the removal of low-growing vegetation and soils in the footprint of all decommissioning/ construction works. This will predominantly take place on heathland and grassland vegetation, which is of negligible value for feeding and commuting bats. No trees, hedgerows or other linear habitats will be removed, so there will be no severance or disturbance of commuting routes or feeding areas. Therefore, habitat loss during site clearance works will not cause any adverse effects on bats. Further details are provided in **Technical Appendix A8.3**.

8.6.2 Fisheries

100. The potential for impacts on fisheries and aquatic habitats during the initial decommissioning/construction phases is mainly associated with ground disturbance and the release of sediments into surface water features. There is also a potential impact from the accidental spillage of other hazardous substances (oil and fuel) used in the decommissioning/construction process, and the construction of stream crossings could obstruct fish movements. The Site is hydrologically connected to watercourses of significant fisheries interest, particularly the River Main, which has spawning areas for Atlantic salmon. The un-mitigated effects of suspended solids, may be of Moderate Adverse Magnitude and of Moderate to Large Adverse Significance depending on the sensitivity of individual watercourses. Further details are provided in **Technical Appendix A8.4**.

8.6.3 Operational Phase

101. Effects that would last for the duration of the operational phase are considered to be permanent, but they would be reversible should the proposed Development infrastructure be decommissioned at any point.

8.6.3.1 Designated sites

102. No significant releases of sediment or any other pollutants are anticipated during the operation of the Development. As a result, there will be no negative effects on downstream watercourses or associated designated sites. Further details are provided in **Technical Appendix A8.2** and **Chapter 7**.

8.6.3.2 Habitats

103. There will be no significant groundworks during the operational phase of the Development beyond the areas considered as part of decommissioning / construction activity, so there will be no further effects on habitats.

8.6.3.3 Badgers

104. All of the badger setts are located more than 100 m from any aspect of the Development infrastructure, so there is no risk of direct or indirect effects on any setts.

[12] Northern Ireland Environment Agency, 2011. *Badgers and Development*. Available online at https://www.daera-ni.gov.uk/publications/badgers-development

8.6.3.4 Bats

105. Two bat species were recorded in significant numbers (i.e., moderate or high activity) during automated detector surveys - Leisler's bats and common pipistrelles - both of which are considered to have a high collision risk from wind turbines (SNH 2019). However, moderate or high activity of these species was recorded on less than 1% of sampling nights, and there was no temporal or spatial pattern to the dataset, so it was concluded that neither species uses the Study Area as a feeding area or commuting route on a regular basis.

106. Based on the profile of bat activity collected in baseline surveys, there is not considered to be a significant risk of collision-related fatalities during the operation of the Development. Therefore, the operation of the Development will have an imperceptible effect on foraging and commuting bats, and will not have a significant effect on local bat populations. Further details are provided in **Technical Appendix A8.3**.

8.6.4 Fisheries

107. The potential for any effects will be significantly reduced during the operational phase. Nonetheless it has been assumed that, un-mitigated effects from surface water run-off has the potential to be of Moderate Adverse Magnitude and of Moderate Adverse to Moderate to Moderate/Large Adverse Significance depending of the sensitivity of individual watercourses. Further details are provided in **Technical Appendix A8.4**.

8.7 Mitigation and Residual Effects

108. Considering the high ecological value of some parts of the Site, and to assist with the implementation of the proposed habitat reinstatement and compensation measures, an Ecological Clerk of Works (ECoW) will be employed for the duration of the initial decommissioning/construction works. The role of the ECoW is to assist the contractor with the interpretation and implementation of the ecological mitigation measures outlined in **Chapters 8 and 9** of the ES, including those outlined in the Draft Habitat Management Plan (**Technical Appendix A3.2**) and other relevant documents. The contractor will liaise with the ECoW prior to the commencement of the initial decommissioning/construction works so that all ecological mitigation measures can be incorporated into the programme. The ECoW will review the method statements of all contractors in order to ensure that they are consistent with the mitigation strategy. They will visit the Site on a weekly / fortnightly basis during the works and will keep a written record of the mitigation measures that have been implemented.

8.7.1 Measures to protect watercourses and associated designated sites

109. A range of hydrological mitigation developments have been proposed for the initial decommissioning / construction phases of the Development, which are described in the Outline Decommissioning / Construction Environmental Management Plan (Outline DCEMP, **Technical Appendix A3.1**) and the Outline Water Construction and Environmental Plan (Outline WCEMP), **Technical Appendix A7.2).** These documents are considered to be embedded mitigation, as they will form an inherent part of the Development, but in the context of Appropriate Assessment they are considered to be traditional mitigation measures, so they are repeated below, and in **Technical Appendix A8.2**. For the purposes of EIA, they are embedded (because they are normal good practice construction measures, rather than site-specific measures), so the summary of effects provided below includes the embedded mitigation in the "predicted effect", with no specific mitigation required.

110. In summary, the hydrological mitigation measures for the initial decommissioning / construction phases of the Development, as outlined in the Outline DCEMP and Outline WCEMP are:

- Buffer zones for watercourses, and restrictions on works within these zones;
- Measures for the control of exposed sediments;
- A system of interceptor drains and settlement ponds to control suspended sediments;
- Procedures for the storage of cement (and related materials), for the pouring of concrete, and the cleaning of equipment;
- Procedures for the storage of hydrocarbons, for the refuelling of vehicles, and for responses to any spills; and
- Monitoring and maintenance of the implementation of these measures.

111. The system of interceptor drains and settlement ponds will remain in place during the operation of the Development, and will be monitored and maintained as required.

8.7.2 Fisheries

112. The hydrological mitigation measures outlined above will also avoid or minimise effects on fisheries and aquatic ecology in downstream watercourses. The mitigation measures will avoid direct damage to fish and the siltation of spawning / nursery habitats, and will minimise the risk that other construction-related pollutants are accidentally released into the river network. This will reduce the effects from Moderate Adverse Significance to Neutral. Further details are provided in **Technical Appendix A8.4**.

8.7.3 Measures to protect sensitive habitats

113. The following measures will be employed during the initial decommissioning / construction phases:

- Prior to the commencement of construction works, the ECoW will brief the contractor and construction staff on the ecological sensitivities of the Site, including all ecological mitigation measures outlined in the ES and HMP;
- All works will take place within the appointed areas, and there will be no earthworks, material storage, etc. outside the Development footprint; and
- The ECoW will accompany the contractor when marking out the boundaries of the construction site in order to protect adjacent sensitive habitats and features of value for fauna. Where appropriate, features may be micro-sited in order to avoid any such features.

114. All turbines will have a micro-siting flexibility of up to 50m to account for local ground conditions. The proposed Turbines 2, 3, 4 and 5 are located in areas of relatively homogenous habitat, so micro-siting of these turbines would not change the significance of any ecological effects. However, Turbine 1 is surrounded on all sides by intact blanket bog (which is active peat), and it is possible that micro-siting could increase the effect on this habitat. Therefore, the ECoW will review any proposed micro-siting for this Turbine in order to ensure that it has no additional effect on intact blanket bog. Similarly, any micro-siting of turbines within the 50m / 20m exclusion zones around streams / drains will be reviewed by the ECoW.

8.7.4 Reinstatement of temporarily disturbed areas

115. When constructing hardstand platforms, some of the excavated peat will be 'side cast' and used to form low ridges along the sides of the road, including for the construction of interceptor drains as part of the surface water management system. All other peat will be used for the reinstatement of redundant access tracks, particularly in the areas identified for improvement as outlined in the Draft HMP. When all groundworks are complete, both areas will consist of bare peat, which will be vulnerable to desiccation and erosion. Peat excavated from below the surface does not have a viable seedbank, so it is reliant on windblown seed for vegetation recolonisation, and it can take several years for the bare peat to revegetate fully. In order to reduce the period of peat exposure, some measures will be taken to seed these features with appropriate vegetation, as follows:

- When commencing earthworks in undeveloped areas, the top 200 mm of surface peat and vegetation will be stripped and laid to one side, outside the footprint of the Development;
- The underlying peat and other spoil can be then excavated, and 'side cast' to create roadside mounds, or used for other habitat management measures;
- Deposited peat will be shaped, flattened and compacted as much as possible, in order to minimise the desiccation and erosion of peat; and
- When all the initial decommissioning/construction work is complete, the reserved 200 mm of surface peat and vegetation will be spread across the top of the deposited peat and pressed into the peat surface, in order to provide a seed-source for re-vegetation in future years.

116. If vegetation fails to establish in the first two years, additional seed can be spread across the habitat, either collected from within the Site, or potentially purchased as seedstock from third parties (e.g. locally-sourced *Sphagnum* seed stock). Common cotton-grass and deergrass are the most effective pioneer species of hydrologically-intact peat, while heathers (ling, cross-leaved heath, crowberry) and heath grasses (wavy hair-grass, sweet vernal-grass) may be more effective at colonising desiccated peat.

117. A range of habitat enhancement measures are described in detail in **Technical Appendix A3.2: Draft Habitat Management Plan**. These measures are described in greater detail in **Section 8.6.1.2.**

8.7.5 Precautionary measures for the protection of badgers during construction works

118. Some simple precautionary measures will be taken to avoid or minimise effects on any badgers that may forage in the Site, as follows:

- Chemicals and fuels will be stored in locked containers in the site compound;
- Any trenches deeper than 0.5 m will be constructed in a manner that allows trapped animals to escape, either by creating a shallow slope at one end, or by propping planks in the trench overnight; and
- Any open pipe systems (e.g. cable ducts) will be capped or blocked overnight in order to prevent badgers gaining access.

8.7.6 Precautionary measures for the protection of lizards during construction works

119. When consulted at the Scoping stage of the project, the NIEA (Natural Environment Division) requested that some generic mitigation measures should be provided for common lizards during the works. The risk of negative effects on lizards is considered to be very low, but some precautionary measures are also outlined below:

- The hardstands and access tracks of the existing Operational Corkey Windfarm may provide refuges for hibernating lizards during winter months. If the decommissioning of these features will take place during the hibernation period (usually October to March, inclusive), the ECoW will inspect relevant areas beforehand, involving a search for hibernating lizards in loose gravel around the margins of the infrastructure; and
- When construction of the Development is complete, artificial refugia consisting of piles of logs, brash and/or large stones will be created beside each of the new hardstand platforms. This process will be overseen by the ECoW.

8.8 Monitoring

120. As part of the measures proposed within the Draft Habitat Management Plan for the Development, vegetation sampling will be undertaken for at least nine years after the completion of habitat restoration works, as outlined in **Technical Appendix 3.2: Draft Habitat Management Plan**. Monitoring of water quality will also be carried out as part of the Outline DCEMP and Outline WCEMP, as outlined in **Technical Appendices A3.1 and A7.2**.

121. Current best practice for the monitoring of bat populations at windfarms (as outlined in the Scottish Natural Heritage 2019 guidelines), is that "*post-construction monitoring is normally only required at developments where the mitigation involves turbine curtailment*". As the proposed development will not involve curtailment, and is expected to have a negligible effect on foraging and commuting bats, no post-construction monitoring of bats is necessary.

8.9 Potential indirect, in-combination effects with other developments

122. The Site is located in a rural setting surrounded by agricultural land, farm buildings and one-off houses. It is a settled area and is not subject to significant development pressure. The Northern Ireland planning portal was searched for live or recently-approved applications in the surrounding area, and relevant developments are discussed below and listed in **Technical Appendix A2.3**.

123. Permission was granted in 2018 for a new permanent access road for the Operational Corkey Windfarm (planning reference: LA01/2018/0724/F) from Reservoir Road to the northeast of the Site, and the development has now been constructed and is in use. The design of the road included drainage proposals to avoid pollution of watercourses, and it was subject to Appropriate Assessment, for which it was concluded that there was no risk of impacts on local watercourses or Natura 2000 sites. Therefore, this development provides no risk of in-combination effects.

124. Permission was granted in 2012 for a single 250 kW turbine (planning reference: D/2012/0059/F) in the west of the Study Area. However, the permission had a five-year validity and was not constructed during this period, so it appears to have lapsed.

125. Permission was granted in August 2018 for a poultry unit with capacity for 32,000 laying hens, located approximately 400m to the south-west of the Study Area (planning reference LA01/2017/0273/F). The application included procedures for the collection of waste, and for its disposal in accordance with the Nitrates Directive. It is noted in the officer's report that "*the proposal would not be likely to have a significant effect on the features of any European site*". Therefore, it is not considered to pose a risk of in-combination effects.

126. No other pending or recently-approved developments were identified within 500 m of the Site.

8.10 Summary of Effects

127. Table 8.12 provides a summary of the effects detailed within this chapter.

Table 8.12: Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Decommissioning / Construction Phase				
Watercourses and designated sites	Low risk of pollution during works	Slight effect in a worst-case scenario, but not significant	None, beyond the embedded pollution-prevention measures	Not significant
Lough Neagh and Lough Beg SPA	Low risk of pollution during works	Slight effect in a worst-case scenario, but not significant	None, beyond the embedded pollution-prevention measures	Not significant
Fisheries	Low risk of pollution during works	Neutral effect, not significant	None, beyond the embedded pollution-prevention measures	Not significant
Habitats (including active peat)	Permanent loss of small areas of habitat during construction	Imperceptible effect, not significant	Restoration of degraded blanket bog and wet heath habitat	Slight positive effect in the medium-term
Badgers	Animals may be trapped in trenches or open pipework	Slight, not significant	Providing means of escape in trenches, and blocking pipes overnight	Not significant
Lizards	None	None	Pre-construction surveys, and provision of refugia	Slight positive effect in the long-term
Operational Phase				
Fisheries	Low risk of pollution during works	Neutral effect, not significant	None, beyond the embedded pollution-prevention measures	Not significant

8.11 Statement of Significance

128. Subject to the successful implementation of the proposed mitigation measures, the Development will have neutral or slight-positive effects on all Important Ecological Features. Therefore, the Development will not cause any significant negative effects on designated sites, habitats, legally protected species, or any other features of ecological importance.

8.12 Glossary

Abbreviation	Description
ASSI	Area of Special Scientific Interest
CEDaR	Centre for Environmental Data and Reporting
CIEEM	Chartered Institute of Ecology and Environmental Management
EcIA	Ecological Impact Assessment
ECoW	Ecological Clerk of Works
GIS	Geographical Information Systems
HMP	Habitat Management Plan
IEF	Important Ecological Feature
NI	Northern Ireland
NNR	National Nature Reserve
NVC	National Vegetation Classification System
SAC	Special Area of Conservation
SLNCI	Sites of Local Nature Conservation Importance
SPA	Special Protection Area

9 Ornithology

9.1 Introduction

1. This Chapter of the Environmental Statement (ES) evaluates the effects of the Development on the ornithology resource. This assessment was undertaken by Dr Marc Ruddock of Bird Surveyors Ltd (BSL). The assessment will consider the potential effects of the Development during the following development stages:

- Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

2. The decommissioning of the Operational Corkey Windfarm and the construction of the Development are likely to occur partly in tandem. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the decommissioning of the Development is considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

3. This Chapter of the ES is supported by the following figures, in **Volume 2 Figures**, and Technical Appendices, in **Volume 3 Technical Appendices**:

- A9.1: Ornithology Surveys 2014 - 2019;
- A9.2: Data Review;
- A9.3: Collision Risk Modelling (CRM);
- A9.4: Operational Phase Bird Monitoring Plan; and
- Figures 9.1 – 9.57.

4. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

9.2 Legislation, Policy and Guidance

5. The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Environmental Impact Assessment Directive 85/337/EEC (as amended);
- EU Council Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of wild flora and fauna (the Habitats Directive);
- The Conservation (Natural Habitats, etc.) Regulations 1995 (as amended) which transposes the Habitats Directive into law in Northern Ireland (the Conservation Regulations);
- The Wildlife (Northern Ireland) Order 1985 (as amended) (the Wildlife Order);
- The Wildlife & Natural Environment (Northern Ireland) Act 2011;
- Planning Policy Statement 2 (PPS 2) Planning & Nature Conservation;
- Planning Policy Statement 18 (PPS 18);
- JNCC (2012) UK Biodiversity Action Plan;
- Local Biodiversity Action Plans (www.biodiversityni.com);
- Balmer et al. (2013). Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland. British Trust for Ornithology;
- Colhoun & Cummins (2013). Birds of conservation concern in Ireland 2014 – 2019;
- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition;
- DOE (2015). DOE Planning & Environment: Standing advice for planning officers and applicants seeking planning Permission for land which may impact on wild birds;
- Eaton et al., (2015). Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man;
- NIEA (2010). Wind Energy Development in Northern Ireland's Landscapes: Supplementary Planning Guidance to accompany Planning Policy Statement 18 'Renewable Energy'. NIEA Research and Development Series No 10/01, Belfast;
- Ruddock & Reid (2010). Review of windfarms and their impact on biodiversity: Guidance for developments in Northern Ireland. Report by the Natural Heritage Research Partnership, Quercus for the Northern Ireland Environment Agency, Northern Ireland, UK;
- Percival (2001; 2003) Birds and windfarms: a review of potential issues and impact assessment. Ecology Consulting 25pp
- Tosh et al. (2014). A review of the impacts of wind energy developments on biodiversity. Report prepared by the Natural Heritage Research Partnership (NHRP) between Quercus, Queen's University Belfast and the Northern Ireland Environment Agency (NIEA) for the Research and Development Series No. 14/02;
- SNH (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoiding action, Scottish Natural Heritage;
- SNH (2005). Survey methods for use in assessing the impacts of onshore windfarm on bird communities. Scottish Natural Heritage;
- SNH (2006). Assessing significance of impacts from onshore windfarms on birds' out-with designated areas. July 2006. Scottish Natural Heritage;
- SNH (2009). Guidance on methods for monitoring bird populations at onshore wind farms. Guidance Note, January 2009. Scottish Natural Heritage;
- SNH (2010a). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. November 2005 (revised December 2010), Scottish Natural Heritage;
- SNH (2010b). Use of avoidance rates in the SNH wind farm collision risk model. Scottish Natural Heritage;
- SNH (2011). Guidance on assessing connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage;
- SNH (2012a). Assessing the cumulative impact of onshore wind energy developments. Scottish Natural Heritage;
- SNH (2012b). Instruction Notice No. 099 - Dealing with development management casework where these is less raptor activity than expected. Scottish Natural Heritage;
- SNH (2013a). Recommended bird survey methods to inform impact assessment of onshore windfarms. Scottish Natural Heritage;
- SNH (2013b). Assessing connectivity with Special Protection Areas (SPAs). July 2013. Scottish Natural Heritage;
- SNH (2014a). Assessing the impact of small-scale wind energy proposals on the natural heritage. Version 2 June 2014. Scottish Natural Heritage;
- SNH (2014b). Flight speeds and biometrics for collision risk modelling. October 2014. Scottish Natural Heritage;
- SNH (2014c). Recommended bird survey methods to inform impact assessment of onshore wind farms. May 2014. Scottish Natural Heritage;
- SNH (2014d). Guidance on repowering wind farms: bird survey requirements. November 2014. Scottish Natural Heritage;
- SNH (2015a). Good practice during wind farm construction. Scottish Natural Heritage. Version 3;
- SNH (2015b). Spatial planning for onshore wind turbines – natural heritage considerations. Scottish Natural Heritage;
- SNH (2016). Assessing Connectivity with Special Protection Areas (SPAs). Scottish Natural Heritage;
- SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms. Scottish Natural Heritage;
- SNH (2018) Avoidance rate information & guidance note: Use of avoidance rates in the SNH wind farm collision risk model. Scottish Natural Heritage, Edinburgh, UK;
- SNH (2018). Assessing the cumulative impact of inshore wind farms on birds. Scottish Natural Heritage; and
- SNH (2018). Assessing significance of impacts from onshore windfarms on birds out-with designated areas. Scottish Natural Heritage.

9.3 Assessment Methodology and Significance Criteria

9.3.1 Scoping Responses and Consultations

6. This Chapter has been informed by appropriate consultation undertaken during the Environmental Impact Assessment (EIA) process undertaken prior to planning application stage. In addition, a Scoping exercise was completed in advance of surveys and in consultation with NIEA. Relevant EIA scoping responses and/or data were received from:

- Northern Ireland Environment Agency (NIEA within DAERA);
- Royal Society for Protection of Birds (RSPB); and
- Forest Service Northern Ireland (DAERA).

7. Key matters in the scoping opinion from consultees were for the site feature species of the Antrim Hills Special Protection Area (SPA) for hen harrier and merlin, and that species-specific surveys were undertaken. The Scoping Opinion is provided in **Technical Appendix A2.2**.

8. Consultation was received from the organisations shown in **Table 9.1**.

Table 9.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
NIEA (Natural Heritage – Ornithology)	Meeting 04/03/2014	Review of survey scope and timings	Scope of survey works agreed
NIEA (Natural Heritage – Ornithology)	Meeting 09/04/2015	Review of year 1 surveys (2014 – 2015) Habituation noted in the Operational Corkey Windfarm site; particularly for snipe More details requested on wintering hen harrier roosts Agreement that no CRM required for golden plover on basis of established evidence of negligible likely impact Mitigation options discussed; pending calculations of displacement, disturbance, collision CRMs required for peregrine, and any other species at risk of collision; request for further information on buzzard, kestrel and raven activity and CRM.	Meeting note prepared and agreed Further details of this and the inter-annual variability presented and analysed in **Chapter 9; Technical Appendix A9.1**) and illustrated in Figures. Further details presented in **Chapter 9; Technical Appendix A9.1; Confidential Figures** Details of detections, flight paths and review of literature prepared in **Chapter 9; Technical Appendix A9.1**; Figures as informatives Details of displacement and effects outlined in **Chapter 9; Technical Appendix A9.1**. Negligible effects predicted compared to baseline (Operational Corkey Windfarm). Habitat management plan details restoration of c9.4ha of site which will benefit snipe Details of collision risk presented for peregrine falcon, hen harrier, merlin, curlew, buzzard, kestrel and raven in **Chapter 9; Technical Appendix A9.3** and illustrated in associated Figures.
			Buzzard, kestrel, raven CRM caveated as discussed. Agreed that these were secondary species in relation monitoring protocols but that further information remained desirable
		Operational monitoring programme required	Details of operational monitoring programme presented in **Chapter 9**
		Acceptance that construction in breeding season acceptable in principle subject to pre-construction surveys, on-going nest monitoring and avoidance of snipe by 400 m, curlew by 800 m	Details of construction phasing and disturbance avoidance measures presented in **Chapter 9**
		Agreement that no additional surveys required	Additional surveys undertaken by SPR to maintain updated programme of works and findings to inform Chapter. Results of additional surveys 2015 – 2019 presented in **Chapter 9 and Technical Appendix A9.1; A9.3**
NIEA (Natural Heritage – Ornithology)	Phone meeting 10/03/2016	Review of survey scope of works to maintain up to date data	Completion of additional scope of surveys as discussed for 2016-2017; further works undertaken over and above agreed scope of works in 2018 – 2019 which are presented in **Technical Appendix A9.1; A9.3 & Chapter 9**
DAERA Planning Response Team (NIEA - NED)	Scoping Opinion 21/02/2018	Likely effects arising from proposed repowering over and above baseline (Operational Corkey Windfarm) Likely effects arising to designated sites and important species including Antrim Hills SPA; Slieveanorra / Croaghan ASSI and hen harrier, merlin, peregrine falcon, curlew, snipe Potential effects arising due to loss of wintering, breeding, foraging habitats	Review of data and analysis undertaken comparing baseline (Operational Corkey Windfarm) and proposed repowering to inform **Chapter 9 and Technical Appendix A9.1; A9.3** Review of designated sites completed in **Technical Appendix A9.1**; review of sensitivities of species including those outlined by NIEA and analysis presented in **Chapter 9; Technical Appendix A9.1; Technical Appendix A9.3** Potential effects on breeding, wintering and foraging habitats all reviewed and considered in **Chapter 9**

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Potential effects arising due to direct mortality and collision	Potential effects of collision reviewed, analysed and considered in **Chapter 9 and Technical Appendix A9.3**
		Potential effects arising due to displacement due to disturbance / decreased suitability of habitats	Potential effects of displacement reviewed, analysed and considered in **Chapter 9 and Technical Appendix A9.3**; including displacement modelling for key ornithological receptors
		Requirement for HRA for Antrim Hills SPA	Review of available literature, research, field survey data, collision risk and displacement modelling undertaken in **Chapter 9; Technical Appendix A9.1; Technical Appendix A9.3** and sHRA included in **Technical Appendix A8.2**.
		Content with the approaches taken in collecting baseline information	Scope of surveys agreed and discussed with NIEA throughout duration of the programme.
		Disagrees in scoping out specific ecological effects	Additional information presented in Chapter 9 to inform scoped out effects and to ensure appropriate information available for consultees in order to inform likelihood of effects for repowering project
		Content with scope of works completed for ornithology	Scope of surveys agreed and discussed with NIEA throughout duration of the programme
		Principle issues (peregrine, curlew, snipe, hen harrier, merlin)	Reviews and presentation of data for all key ornithological receptors to inform assessment all presented, mapped where required and analysed in **Chapter 9; Technical Appendix A9.1; A9.2; A9.3**
		Scoped out significant effects include: -curlew impacts via design and set-back distances - snipe effects based on evidence of habituation and sensitive timing of construction management	Whilst disagreed with principle (see above) it is agreed that these identified risks can be scoped out which is confirmed by the evidence base presented and reviewed in **Chapter 9**. As required the design, set-back distances, displacement modelling, collision risk modelling
		- collision / displacement to whooper swans and geese based on set-back distances - collision risk to golden plover based on published evidence and low collision likelihood	and review of evidence is presented and analysed in **Chapter 9; Technical Appendix A9.1; A9.2; A9.3** to inform consultee views and confirm the position on these factors being scoped out from significant effects. Details of disturbance avoidance measures and mitigation are included in **Chapter 9**
		Requirement for further details on: - Collision risk models (peregrine falcon) - Displacement modelling for curlew and snipe - Collision risk models (all species through 500 m buffer) - Analysis of footprint of development on breeding passerines	Details of collision risk modelling, displacement modelling and footprint analysis are all presented in **Chapter 9; Technical Appendix A9.1; A9.2; A9.3** and the findings reviewed and considered in the context of population sizes, conservation status and evidence of habituation at the Operational Corkey Windfarm (baseline). Comparative details provided for operational and proposed windfarm as required. Collision risk models for some (secondary) species are caveated, as discussed with NIEA, but information presented as requested by NIEA.
DAERA – Forest Service	Scoping Opinion 11/10/2017	Identifies nearby designated sites including Antrim Hills SPA; Slieveanorra ASSI / Nature reserves Identifies red grouse in the vicinity of the windfarm	Details of designated sites are presented in **Technical Appendix A9.1** and reviewed in **Chapter 9** Details of red grouse distribution and abundance presented in **Technical Appendix A9.1**; associated Figures and reviewed in **Chapter 9**.
NIEA (Natural Heritage)	Meeting 18/12/2018	Additional survey information acknowledged Recognition of apparent habituation observed by some species and that the baseline was an Operational Corkey Windfarm	Details of additional survey works provided in **Chapter 9; Technical Appendix A9.1; A9.3** Details of findings and inter-annual changes presented in **Chapter 9; Technical Appendix A9.1; A9.3**; species mapping and figures presented to show abundance and distribution as well as habituation / tolerance / avoidance of Operational Corkey Windfarm.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		Avoidance of hen harrier by a minimum of 500 m and following best practice guidance and site-specific metrics	Set-back distances for hen harrier (merlin and all other species) presented in **Chapter 9**; Confidential Figures. Avoidance by windfarm design in line with best practice guidance and research
		Requirements for CRM and displacement modelling to be undertaken for both operational and proposed windfarm	Details of CRM and displacement modelling all undertaken for both Operational Corkey Windfarm (baseline) and proposed windfarm and results compared and analysed in **Chapter 9**
		Details of historical data and/or collision fatalities if available for the site	No historical information available from original application stage, but detailed baseline surveys conducted 2014 – 2019 and monitoring programme proposed to ensure relevant post-construction data are collected. SPR conducts on-going mortality reporting and recording strategy at all operational sites. No records of collision mortality historically identified at Corkey
RSPB	Scoping Opinion 8/11/17	Content with scope of surveys undertaken	Additional surveys have been undertaken since the scoping opinion during 2018-2019
		Comments over location of vantage points within the development site	Response and details of rationale provided in methodology section **Technical Appendix A9.1**
		Review of mitigation (including agricultural / habitat management; time restrictions on construction	Displacement and disturbance review undertaken to consider mitigation; HMP proposed to reinstate and restore c9.4ha of habitat which will benefit bird species; details of construction management strategy provided in **Chapter 9**
		Advocates “no loss of biodiversity”	There are negligible effects predicted from baseline (Operational Corkey Windfarm) to Development; in some incidences risk is reduced as a result of the Development. Details presented in **Chapter 9**
		Monitoring should take place under a BACI approach and encouraged	Programme of monitoring works is set out based likely effects of the
		publication of results from the findings of the programme of monitoring	Development. We understand that the Scottish Windfarm Bird Steering Group has recently reviewed the efficacy of BACI monitoring and that there are inherent difficulties in identifying adequate control sites (including at Altaveeden nearby) and at Corkey this would effectively require a control to include another operational windfarm
		Data request services available upon receipt	Data request carried out May 2018; but no results received to date; happy to review these findings further upon receipt; BTO data request carried out to identify any other species at risk; results of desktop review presented in **Technical Appendix A9.1**

9.3.2 Scope of Assessment

9. The key issues for the assessment of potential ornithological effects relating to the Development are:

- Temporary effects arising from the decommissioning / construction phases;
- Permanent / direct effects; and
- Indirect effects, including the displacement of species.

10. The footprint of Development due to turbines, turbine blades, nacelles, towers and/or ancillary windfarm infrastructure (e.g. sub-station, energy storage, power-lines, meteorological masts) for the decommissioning/construction and operational phases, has the potential to lead to three main effects on birds (SNH, 2018):

- Direct loss of breeding, wintering and/or foraging habitat;
- Direct mortality due to collision; and/or
- Displacement of birds as a result of increased disturbance and/or decreased suitability of breeding, wintering and/or foraging habitats.

9.3.3 Elements Scoped Out of Assessment

11. Further consideration and assessment is required based on a final layout, prior to determining if any ornithological effects can be scoped out of the assessment. It is anticipated that direct effects on curlew territories can be scoped out, due to the distance between the recorded curlew location and the Development.

12. It is noted that there is strong evidence of habituation of some species within the Operational Corkey Windfarm, in particular numerous active (and successful) snipe territories were recorded within the Operational Corkey Windfarm therefore indicating habituation to operational turbines. The baseline findings indicate habituation to the operational turbines but that this, and other species, may still be vulnerable to decommissioning/construction activities.

13. Red grouse territories recorded within the Operational Corkey Windfarm and at one territory a covey of seven birds was recorded in the autumn counts, so grouse are breeding successfully in the survey area. The baseline findings indicate habituation to the operational turbines but that this, and other species, may still be vulnerable to decommissioning/construction activities.

14. There were no goose or swan flights recorded within the vantage point surveys over the survey area and 500 m buffer, despite wider occurrence of roosting whooper and greylag geese. There appears to be no connectivity or movement corridor for these species near the Site Boundary and thus low weighting is given to effects on these species.

15. Some (non-breeding) golden plover flights were recorded, which could be subject to collision risk. However published literature indicates that this species shows considerable avoidance and lack of effect due to windfarms (Fielding & Haworth, 2010[1]; Douglas et al., 2011[2]) although some recent studies indicate breeding season effects (Sansom et al., 2016[3]). Thus significant effects may be considered unlikely based on published literature, as such they will be considered in this Chapter, but no collision risk model is proposed to be undertaken for this species, as agreed with NIEA (**Table 9.1**).

16. It is noted that NIEA in the scoping opinion "*disagreed with the intention to scope out some ecological impacts*". It is noted that in relation to ornithology, NIEA agreed that a number of additional factors could be scoped out subject to presentation of data and appropriate windfarm design and mitigation, particularly in relation to construction (**Table 9.1**) and the requisite information to inform NIEA is made available here, **Chapter 9**, and also in **Technical Appendices A9.1; A9.2; A9.3**. Thus whilst the Chapter has scoped out a number of non-significant effects, as agreed with NIEA, all of the target species and findings are reviewed and the evidence, including for those effects which were scoped out is presented to provide an evidence base to NIEA and other consultees.

9.3.4 Study Area / Survey Area

17. The ornithological survey area was digitally mapped in ArcGIS 10.5 and defined as the Site Boundary (as defined at scoping) buffered by 500 m (hereafter 500 m Survey Area) respectively for breeding and wintering bird surveys and vantage point surveys (**Figure 9.1**). This buffer was selected as recent research has shown the majority of wind turbine effects are prevalent up to 500 m (Pearce-Higgins et al., 2009[4], Ruddock & Reid, 2010[5]; **Figure 9.1; Figure 9.2**).

18. An 800 m buffer of the Site Boundary (hereafter 800 m Survey Area) defined the search area for curlew during breeding season surveys; as displacement effects on this species are considered high up to 800 m (Pearce-Higgins et al., 2009; **Figure 9.1**). The wider priority species survey area was defined as the 2 km buffer of the Site Boundary (hereafter 2 km Survey Area) to search for hen harrier and merlin nest locations and/or breeding territories or wintering locations of species considered vulnerable and/or priority species within Northern Ireland (**Table 9.1**). A wider search area up to 5 km (hereafter 5 km Survey Area) was utilised during priority searches for hen harrier and merlin and for wintering swans and geese (**Figure 9.3**).

9.3.5 Design Parameters

19. For the purposes of this Chapter the details of the Development are included in **Chapter 3: Development Description.**

9.3.6 Baseline Survey Methodology

20. The knowledge of the spatial and temporal occurrence of bird species within and surrounding the Site (see **Technical Appendix A9.1**) is essential to inform the likely effects of the Development.

21. Where available national documents have been utilised and in the absence of some national best practice guidance, Scottish Natural Heritage (SNH) guidance has been reviewed and incorporated where necessary and an extensive review of relevant and published literature and peer-reviewed science which are referenced in text where relevant (see also **Technical Appendix A9.1**). A range of expert guidance documents have thus been utilised throughout the Scoping, design and preparation of this Chapter. This Chapter is further supported by **Technical Appendix A9.1** and should be read in conjunction with this Chapter and also the associated figures **Volume 2 Figures.**

22. The survey programme and assessment methods have been designed and reviewed throughout following best practice information (see also **Technical Appendix A9.1**) including regional and nationally recognised best practice guidance and published literature (**Section 9.2**). The methods utilised have four main aims:

- To provide baseline data on all extant ornithological features to establish the risk posed to birds due to the Development;
- To quantify the risk of collision with turbines to extant bird species flying through the Development area throughout the year;
- To identify locations of priority target species territories to establish risk posed due to Development; and
- To identify mitigation options and future monitoring needs, where required, upon assessment of disturbance and/or displacement and/or collision risk due to the Development

23. The objectives were to:

- Establish the sensitivities and designated site features within the landscape, in particular to establish and identify any species-specific risks and identify key ornithological receptors
- Establish the distribution and abundance of nearest known priority species using desk-based studies;
- Establish the spatial distribution and relative abundance of all bird species from primary field surveys during the breeding and wintering season from walkover and vantage point surveys within the 500 m Survey Area;
- Establish the breeding distribution and abundance of curlew *Numenius arquata* within the 800 m Survey Area (see Pearce – Higgins et al., 2009);
- Establish the breeding distribution and abundance of snipe *Gallinago gallinago* within the 500 m Survey Area;
- Establish the breeding distribution and abundance of red grouse *Lagopus lagopus* within 500 m Survey Area;
- Establish the distribution and abundance of priority species (specifically waders, raptors, swans and geese) from primary field surveys during both the breeding and wintering season within 2 km and 5 km (swans / hen harrier / merlin); and
- Establish the distribution and abundance of suitable displacement habitats or mitigation options and provide recommendations for management, if necessary.

24. The key ornithological receptors are defined as species occurring within the zone of influence of the Development upon which likely significant effects are anticipated and assessed. The zones of influence for individual ornithological receptors refers to the area within which potential effects are anticipated (500 m / 800 m / 2 km / 5 km Survey Areas) and were assigned following best available guidance (SNH 2016) and published literature. The methodology for assessment followed a precautionary screening approach with regard to the identification of Key Ornithological Receptors. Following a comprehensive desk study, initial site visits and consultation, a list of "Target species" likely to occur in the zone of influence of the Development was derived (**Technical Appendix A9.1; Table 9.1**). The survey work carried out on the Site was specifically designed to survey for these identified target species in accordance with SNH guidance (2005; 2013; superseded by SNH, 2017). The target species list (see **Technical Appendix A9.1**) was derived from:

- SNH (2018). Assessing the cumulative impact of onshore windfarms on birds. Scottish Natural Heritage;
- SNH (2018). Assessing significance of impacts from onshore windfarms on birds outwith designated areas. Scottish Natural Heritage;
- Designated feature species of Special Protection Areas (SPA) within the zone of likely significant effects;
- Annex I of the Birds Directive;
- Species protected under Schedule 1 of the Northern Ireland Wildlife Order 1985 as amended by the Wildlife and Natural Environment (WANE) Act 2011;
- Red and Amber listed birds of Conservation Concern (Colhoun & Cummins, 2013; Eaton et al., 2014); and
- Published and peer-reviewed scientific literature which identifies species or assemblage specific sensitivities or effects (e.g. Pearce-Higgins et al., 2009; 2012).

25. Following analysis of the collated bird survey data, it was possible to refine the list of target species to identify key ornithological receptors and associated sensitivities (see Table 9.7) and exclude species which were not recorded during the extensive surveys and those for which pathways for a potential significant effect could not be identified.

26. The survey scope of works has been designed utilising best practice guidance and scoping of the proposed survey works have been discussed and findings reviewed with NIEA ornithologists (**Table 9.1**). The following field surveys which have been undertaken between 2014 and 2019:

[1] Fielding, A.H. & Haworth, P.F. (2010). Golden eagles and wind farms. A report created under an SNH Call-of-Contract arrangement 56 pp.
[2] Douglas, D. J. T., Bellamy, P. E. & Pearce-Higgins, J. W. (2011). Changes in the abundance and distribution of upland breeding birds at an operational windfarm *Bird Study* 58: 37-43.
[3] Sansom, A., Pearce-Higgins, J.W. & Douglas, D.J.T. (2016). Negative impact of wind energy development on a breeding shorebird assessed with a BACI study design. IBIS 158: 541-555
[4] Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. & Bullman, R. (2009a). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology* 46: 1323-1331.
[5] Ruddock, M. & Reid, N. (2010) Review of windfarms and their impact on biodiversity: Guidance for developments in Northern Ireland. Report by the Natural Heritage Research Partnership, Quercus for the Northern Ireland Environment Agency, Northern Ireland, UK.

- Breeding vantage point observation (March 2014 – August 2014) & (March 2018 – August 2018);
- Wintering vantage point observation (September 2014 – February 2015) & (September 2018 – March 2019);
- Spring migration vantage point observation (January 2014 – April 2014) & (January 2018 – April 2018);
- Autumn migration vantage point observation (September 2014 – November 2014) & (September 2018 – November 2018);
- Breeding walkover surveys (Brown & Shepherd[6] + passerines) (March 2014 – August 2014 & March 2018 – August 2018); including;
  - Prey species surveys (April 2014 - July 2014) & (April 2018 – July 2018);
  - Woodland point counts (April 2014 – July 2014) & (April 2018 – July 2018);
- Wintering walkover surveys (September 2014 – February 2015);
- Breeding priority species surveys (March 2014 – August 2014); including
  - Snipe surveys (May 2014) & (May 2018);
  - Red grouse surveys (April 2014; August 2014) & (April 2018; August 2018);
- Wintering priority species surveys (September 2014 – February 2015) & (September 2018 – February 2019);
- Supplementary breeding / wintering priority species surveys (March 2015 – August 2015; March 2016 – April 2017).

27. The surveys were undertaken by experienced field ornithologists, under licence from NIEA (where necessary). Full details of the survey methods, survey effort, and weather conditions are presented in **Technical Appendix A9.1**; see also T**able 9.2** of **Technical Appendix A9.1** for summary of survey effort and programme, which is not replicated further here**.**

9.3.7 Methodology for the Assessment of Effects

28. The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect.

29. The assessment follows the requirements set out in the EIA Regulations and standardised guidance (CIEEM, 2018; **Chapter 2)** to focus on potentially significant effects.

30. The assessment (**Section 9.5**) considers the potential effects arising from the footprint of Development due to turbines, turbine blades, nacelles, towers and/or ancillary windfarm infrastructure (e.g. sub-station, battery housing, power-lines, meteorological masts) for the decommissioning/construction and operational phases, are assessed in consideration of direct loss of breeding, wintering and/or foraging habitat; direct mortality due to collision; and/or displacement of birds as a result of increased disturbance and/or decreased suitability of breeding, wintering and/or foraging habitats.

31. The assessment (**Section 9.5**) considers that disturbance can take varying formats and occur over short or long temporal periods. The effects may be transient (e.g. short-term alteration in behaviour) or permanent (e.g. total displacement from the breeding or wintering locations) and that disturbance effects may be lower depending on the tolerance and/or experience/habituation of individuals or species (Ruddock & Whitfield, 2007[7]; Whitfield et al., 2008[8]).

32. The assessment (**Section 9.5**) considers that effects are likely to occur in phases; during the initial decommissioning/construction phases (which will occur simultaneously with the former) and during the operational phase. The decommissioning/construction phases will occur over a short temporal period (approximately eight months) whilst the operational phase will occur over the operational life-time of the Development, which is assumed to be permanent. Cumulative effects can also occur temporally or spatially in combination with other nearby proposals.

33. Assessment of potential effects considered the Survey Areas (500 m, 800 m and 2 km; **Figure 9.1**) which have been defined on the basis of the Indicative Development Area, rather than the Development footprint. These buffers allow an assessment of wider species connectivity in the area and to establish whether beyond the initial decommissioning/construction and operational phase footprint effects are likely within a wider zone of influence. However further assessment is undertaken of the turbine 500 m buffers and the infrastructure footprints for both the Operational Corkey Windfarm and the Development.

34. To establish effects of the Development, additional mapping and modelling analyses were undertaken of the baseline ornithology data (**Technical Appendix A9.1**) which includes comparative data between the existing Operational Corkey Windfarm infrastructure and turbines (baseline) compared to the proposed Development infrastructure and turbines. Additional analyses were completed using the baseline data to review:

- Potential effects types;
- Potential effects on breeding birds and within 500 m of turbines and infrastructure footprint;
- Potential effects on wintering birds within 500 m of turbines and infrastructure footprint;
- Potential effects of collision on birds within 500 m of turbines;
- Collision risk modelling (CRM) - specifically for peregrine falcon; hen harrier; merlin; curlew, buzzard, kestrel and raven;
- Potential effects by species; and
- Potential effects on designated sites and/or site features (Antrim Hills SPA).

35. Following the results from each survey and assessment of the baseline and sensitivity of the ornithological receptor (**Table 9.2**), the direct and/or indirect effects of the Development are analysed. This process considers the necessary mitigation measures and residual effects.

36. The assessment considers each of the potential effects of windfarms (SNH, 2018; **Section 9.3.2**) and for each of these risks, the detailed knowledge of bird distribution and flight activity within and surrounding the Site has been utilised to predict the potential effects of the Development on birds. Effects are assessed with regard to the decommissioning / construction phases, the operational phase and cumulatively in consideration with other projects. Utilising the results from each survey and assessment of the baseline (**Technical Appendix A9.1**), the effects of the Development will be analysed in isolation and in combination (with cumulative developments) and considered based on:

- Type (positive; neutral; negative);
- Extent (see **Section 9.3.7.1**);
- Magnitude (see **Table 9.3**);
- Duration (see **Section 9.3.7.2**);
- Reversibility (temporary, permanent, reversible, irreversible);
- Timing (hourly, daily, weekly, monthly, seasonally, annually); and
- Frequency (once, rarely, occasionally, frequently, constantly).

37. Effects will be reported according to EIA Regulations as either significant or not significant in the context of the sensitivity of the species, the conservation status of bird species (Colhoun & Cummins, 2013; Eaton et al., 2015) and population status and trends of each potentially affected species. If necessary, upon assessment of the effects of the Development, this process considers the necessary mitigation and / or enhancement measures together with any residual effects, as well as cumulative effects.

9.3.7.1 Geographical Extent

38. The geographical extent of the receptors and effects are defined based on population status and trends of each species and/or assemblage utilising the following terms:

- Local level (on site or neighbouring site);
- District level (Causeway Coast and Glens);
- Regional level (Northern Ireland);
- National level (UK); and
- International.

9.3.7.2 Duration of Effect

39. The duration of the effect is defined during the assessment based on:

- Short-term (decommissioning / construction phase); and
- Permanent but reversible (operational phase).

[6] Brown, A.F. & Shepherd, K.B. (1993). A Method for Censusing Upland Breeding Waders. *Bird Study* 40: 189-195.
[7] Ruddock, M. & Whitfield, D. (2007). A review of disturbance distances in selected bird species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage. 181pp
[8] Whitfield, D.P., Ruddock, M. & Bullman, R. (2008). Expert opinion as a tool for quantifying bird tolerance to human disturbance. *Biological Conservation* 141: 2708-2717.

9.3.7.3 Sensitivity of Receptors

40. The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, is be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

41. The framework for determining the sensitivity of receptors is detailed in **Table 9.2**.

Table 9.2: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance. In an ornithological context (Percival, 2003) this includes: Species that form the cited interest of an SPA and other statutory protected nature conservation areas. Cited means mentioned in the citation text for the site as a species for which the site is designated.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance. In an ornithological context (Percival, 2003) this includes: Species that contribute to the integrity of an SPA but which are not cited as species for which the site is designated. Ecologically sensitive species including the following: divers, common scoter, hen harrier, golden eagle, white-tailed eagle, curlew, red necked phalarope, roseate tern and chough. Species present in nationally important numbers (>1% of the UK population)
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance. In an ornithological context (Percival, 2003) this includes: Species on Annex 1 of the EU Birds Directive. Species present in regionally important numbers (>1% regional (Northern Ireland) population). Other species on the regional and/or national red list of Birds of Conservation Concern (Colhoun & Cummins, 2013; Eaton et al., 2015)
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. In an ornithological context (Percival, 2003) this includes: Any other species of conservation interest, including species on regional and/or national amber list of Birds of Conservation Concern (Colhoun & Cummins, 2013; Eaton et al., 2015)
Negligible	The receptor is resistant to change and is of little environmental value. In an ornithological context (Percival, 2003) this includes: Any other species of conservation interest, including species on regional and/or national green list of Birds of Conservation Concern (Colhoun & Cummins, 2013; Eaton et al., 2015)

9.3.7.4 Magnitude of Effect

42. The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

43. The criteria for assessing the magnitude of an effect are presented in **Table 9.3**.

Table 9.3: Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character. In an ornithological context (Percival, 2003) this includes: Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
Medium	A material, partial loss or alteration of character. In an ornithological context (Percival, 2003) this includes: Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
Low	A slight, detectable, alteration of the baseline condition of the asset. In an ornithological context (Percival, 2003) this includes: Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
Negligible	A barely distinguishable change from baseline conditions. In an ornithological context (Percival, 2003) this includes: Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation. *Guide: < 1% population/ habitat lost*

9.3.7.5 Significance of Effect

44. The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. **Table 9.4** summarises guideline criteria for assessing the significance of effects.

Table 9.4: Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

45. Effects predicted to be of major or moderate significance are considered to be ‘significant’ in the context of the EIA Regulations, and are shaded in grey in the above table.

9.3.8 Collision Risk Modelling

46. Field data on target species (peregrine, hen harrier, merlin, curlew) were recorded from four vantage points (**Figure 9.1**) during the breeding season (March 2014 – August 2014 & March 2018 – August 2018; **Technical Appendix A9.1**) and wintering season (September 2014 – February 2014 & September 2018 – March 2019).

47. Collision risk modelling is a two stage process (Band et al., 2007[9]) whereby Stage 1 estimates the number of birds that fly through the rotor swept area (RSA) and Stage 2 predicts the proportion of these birds that could theoretically be hit by the rotor blade (**Technical Appendix A9.3**). The combination of these two stages produces an estimate of collision fatalities in the presumed absence of avoidance behaviour. The model is then adjusted for i) turbine efficiency and ii) avoidance behaviour (set separately at rates of 95%, 98% and 99% successful avoidance) to calculate minimum and maximum likely collision risk (**Technical Appendix A9.3**).

48. For the purposes of the models the area of the both the Operational Corkey Windfarm and Development infrastructure is initially taken to be the envelope as defined by the turbine locations and the associated turbine plus 500 m buffer for which field data were collected. This equates to an area of 2,297,307 m^2; for the Operational Corkey Windfarm, and 2,606,092 m^2 for the proposed Development. These 500 m buffers are utilised to encompass rotor blade length and to minimise spatial error in flight recording accuracy due to the effects of parallax.

49. The area visible from each vantage point (hereafter viewshed) was calculated and ground-truthed (i.e. confirmed during field work) to establish the physical visibility of the viewshed including landscape features (e.g. woodland, spoil heaps etc) that are not accounted for in the computer modelling programme. These viewshed areas were truncated at 2 km as the efficacy of detection rates decline beyond this distance; although varies with size; species; colouration and habitat (Madders & Whitfield, 2006). The VPs are considered to have effectively covered the area of the proposed Development turbines to ground level, when truncated at 2 km, and all airspace out to 2 km and beyond was visible.

50. For the purposes of the modelling process; the bird breeding season is defined as the period March to August inclusive and the non-breeding season as September to February inclusive. Biometric data for each species was derived from Snow & Perrins (1998)[10] and/or published literature review by BTO (2019)[11]. It is assumed in CRM that birds are available to collide with turbines for 365 days per year based on the average monthly day length and activity at the site (**Technical Appendix A9.3; Table A9.1**), although for some species, e.g. curlew were not present in the area during the wintering period (**Technical Appendix A9.1**) and adjustments for seasonal occurrence were made accordingly. Bird flight speeds were derived from Provan & Whitfield (2006)[12] and SNH (2014)[13].

51. The models were constructed for both the existing and the proposed turbines in order to compare the effects between the Operational Corkey Windfarm and the Development. Turbine parameters were entered into the CRM; including the number of turbines (n); hub height (m), rotor diameter (m), rotation period (sec); maximum chord i.e. blade width (m); rotor depth (m); pitch (°) and operation period (%).

- The operational turbines have a maximum hub height of 39 m with a rotor diameter of 37 m (radius 18.5 m from the centre of the hub). Whilst pitch (0.02 – 20°) and rotation period (30 rpm) are often variable in turbines; where a range is available average values were utilised in the CRM for pitch (10°) and the maximum rotation period at 30 rpm (2 seconds for single revolution) respectively.
- Details of the proposed Development turbines are based on a candidate machine assuming worst case parameters (the lowest likely tower height and greatest rotor diameter). The likely candidate turbines have an estimated hub height of 75 m with a rotor diameter of 120 m (radius 60 m from the centre of the hub). Whilst pitch (0.0 – 89°) and rotation period (6.5 – 13.7 rpm) are often variable in turbines; where a range is available average values were utilised in the CRM for pitch (44.5°) and the maximum rotation period at 13.7 rpm (4.38 seconds for single revolution) respectively.

52. Wind turbines were assumed to be operative for 75% of the time due to speed, inclement weather and maintenance. Band et al., (2007) usually considered wind turbine operational time as 75% or greater and in the absence of site-specific wind data the nominal figure of 75% has been utilised.

53. Each species is considered separately between years of survey 2014 – 2015 and 2018 – 2019 and comparison between Operational Corkey Windfarm collision risk estimates and the proposed Development collision risk estimates made. Only those flights which passed through the respective, existing and proposed windfarm (500 m buffer) areas are incorporated to the collision risk modelling (**Figures 9.56 & 9.57**).

[9] Band, W., Madders, M. & Whitfield, D. P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas, M., Hanss, G. and Ferrer, M. (eds). Birds and wind farms: Risk assessment and mitigation. pp Quercus.

[10] Snow, D.W. & Perrins, C.M. (1998). The Birds of the Western Palaearctic. Volume I Non-Passerines. Oxford University Press.

9.3.9 Assessment Limitations

54. There were no significant limitations to the surveys, baseline data or constraints on the assessment. An extensive range of surveys were undertaken during 2014 – 2019. Two parts of the Site were not accessible (**Figure 9.7**) for walkover surveys, but both of these parcels were surveyed using visual and auditory observations from the adjacent landownership areas. There were not considered to be any constraints to species detection undertaking this method and neither parcel has any proposed infrastructure and these parcels also had extant turf extraction activities and extant turbines in the southern parcel and also historical hard-standing infrastructure, a single wind turbine and historical land drainage in the northern parcel.

9.4 Baseline Description

55. The Study Area (**Figure 9.1**) comprises the Operational Corkey Windfarm and infrastructure from Reservoir Road through improved or semi-improved, rushy grazed pasture (**Figure 9.1** within **Technical Appendix A9.1**) and much of the Development comprises existing infrastructure (Figure 3.3). The majority of Study Area is bounded by either post and wire fencing or stone walls (**Figure 9.2**).

56. There are occasional trees or shrubs, particularly blackthorn *Prunus spinosa* or hawthorn *Crataegus monogyna* and one small block of mixed scrub, including bramble *Rubus fruticosus* and gorse *Ulex europaeus* around inaccessible stream features (**Figure 9.2**). From an ornithological perspective, habitats are readily distinguishable in the orthophotography (**Figure 9.2**) with clear evidence of significant agricultural improvement of land along the length of the access track route and Study Area (**Figure 9.1**).

57. The Operational Corkey Windfarm is located in the north of the Site and contains ten 500 kW turbines. There is regular, extensive agricultural activity mostly sheep grazing and some cattle grazing within all areas in and around the Site, and occasional human activity in the windfarm and along the existing access track to the east associated with operational and maintenance activities.

58. A range of improved and semi-natural habitats are present within the Site. The western third of this area was dominated by improved grassland used primarily for livestock grazing, together with scattered private dwellings and a single, small block of coniferous plantation. Improved grassland continues into the central part of the Site in places, e.g., along the north-western bank of the river which cut diagonally through the Site in parallel with the existing access roadway and Control Room.

59. The central and northern most areas within the Site are dominated by a mosaic of wet heath and acid grassland, with the former being more dominant on higher ground and the latter being more dominant on the lower slopes. Small rock outcrops are encountered within the vegetation of this mosaic habitat on occasion, particularly on sloping ground oriented to the south-west, indicating the uneven nature of the bedrock and resulting thin, peaty soils in such places. Such sloping ground was found to harbour scattered individuals of plant species such as broad-leaved marsh orchid *Dactylorhiza majalis*.

60. The eastern and north-central areas within the Site were dominated by modified blanket bog. This is described and effects on it are assessed in **Chapter 8: Ecology and Fisheries**.

61. The eastern-most limit of the 500 m Survey Area (**Figure 9.1**) was dominated by a mosaic of modified blanket bog and acid grassland which stretched into the adjoining Gruig Windfarm. A mosaic of acid grassland, rush pasture and wet heath habitats dominated the northern and southern parts of the 500 m Survey Area, with rush pasture dominated by sharp-flowered rush *Juncus acutiflorus* being particularly prevalent on sloping ground to the north. Such habitat was often more species-rich in places with forbs such as marsh marigold *Caltha palustris*, lesser spearwort *Ranunculus flammula*, marsh willowherb *Epilobium palustre*, marsh thistle *Cirsium palustre*, heath spotted orchid *Dactylorhiza ericetorum* and occasional heath-grass *Danthonia decumbens*. Occasional areas of flushed sward (groundwater dependent terrestrial ecosystems, or GWDTE) were delineated by stands of soft rush *Juncus effusus*, these being rather species-poor with mats of *Sphagnum fallax* and *S. palustre* being the only other notable feature of these occasionally encountered areas.

62. Improved grassland with scattered private dwellings, including the small settlement of Corkey, dominated the western part of the 500 m Survey Area. The dominant land use in these areas was livestock grazing, although an active quarry is present along the north-western part of the 500 m Survey Area. The 800 m Survey Area comprised of relatively higher ground to the

[11] BTO (2019). https://www.bto.org/understanding-birds/birdfacts
[12] Provan, S. & Whitfield, D.P. (2006). Avian flight speeds and biometrics for use in collision risk modelling. Report to Scottish Natural Heritage from Natural Research (Projects) Ltd.
[13] SNH (2014b). Flight speeds and biometrics for collision risk modelling. October 2014. Scottish Natural Heritage;

north-west of Corkey Road, in the area of Knockagallan, dominated by a mosaic of acid grassland and heath, punctuated by localised areas of rush pasture and smaller fields of improved grassland, particularly around the margins of the active quarry. Occasional stands of typically woodland plants were encountered within the sward in this area including wood anemone *nemorosa* and lesser celandine *Ficaria verna*, these perhaps being a relic of old woodland soils in the area and hinting at a former covering of woodland at some stage in the past.

63. With the topography of the land naturally sloping to the south-west, the western and south-western areas within the 800 m Survey Area were dominated by lowland improved grassland in the form of hedgerow-bound and fence-bound fields, these generally being smaller in size than those found at higher elevation close to the centre of the Site. The southern and south-eastern portions of the 800 m Survey Area were dominated by a mosaic of acid grassland, rush pasture, heath and semi-improved pasture, the latter occurring on typically less sloping ground.

64. Modified blanket bog dominated the eastern limit of the 800 m Survey Area, this habitat extending from the plateau of Slievenahanaghan to the immediate west, eastwards towards Altnahinch Road and adjacent Slieveanorra Forest. Improved and semi-natural habitats occur more widely and the extensive coniferous forest of Sitka spruce *Picea sitchensis* dominate the wider 2 km Survey Area (**Figure 9.1**) with some relatively deep area of heathers including *Calluna vulgaris* and *Erica cinerea* in various lacunae in the Slieveanorra Forest complex.

65. The Site is not part of a designated site or site complex, but is located south-west of the Antrim Hills Special Protection Area (SPA) which is designated for breeding hen harrier *Circus cyaneus* and merlin *Falco columbarius*. A wider review of the designations and protected species is review in **Technical Appendix A9.1**.

66. The Development is not located within any sites designated nationally or internationally for ornithological features. The Antrim Hills SPA designated for hen harrier and merlin is located approximately 0.8 km away from the Site Boundary. This SPA was designated in 2006 which is 12 years after the approval of the Operational Corkey Windfarm in 1994. A variety of adjacent windfarms, at Gruig and Altaveeden, and single turbines have been approved nearby since, and post-designation of the SPA.

67. The Slieveanorra & Croaghan ASSI (designated in 2009) is located approximately 3 km away from the Site Boundary and is designated for peatland habitats, but also lists hen harrier, merlin, snipe, red grouse and raven in the citation documents. The Slieveanorra Nature Reserve is located within the 5 km Survey Area and cites hen harrier, merlin and grouse. There are several other designated sites between 5 km and 10 km of the Site Boundary some of which cite ornithology features (see **Table A9.2**). Baseline surveys and assessment will consider, in particular, any flight path connectivity between designated sites.

68. Full baseline results are presented in **Technical Appendix A9.1**; however the key findings are as follows:

- Desktop reviews were undertaken of published distributional data from a variety of published and specific requested data and designated sites in the area.
- During vantage point surveys conducted during up to 19 target species recorded which varied between years and some seasonal variation also recorded between breeding and wintering seasons. A similar range of target species were recorded during spring migration and autumn migration.
- Most frequently detected species from all vantage point surveys were raven, lesser black-backed gull, buzzard and cormorant although the detection frequency varied by vantage point type and seasonally.
- The locations, flight paths and heights were recorded for target 1 species and utilised to inform collision risk modelling; additionally buzzard, raven and kestrel flights were mapped and reviewed in collision risk modelling. There were no swans recorded within the 500 m Survey Area during vantage point observations.
- There were up to 58 species recorded during breeding walkover surveys which varied between years and a smaller number, up to 39 species, recorded during winter walkover surveys.
- Priority species breeding locations confirmed that curlew, buzzard, sparrowhawk, kestrel, raven, red grouse, snipe and peregrine were all recorded breeding within 2 km Survey Area. One curlew territory occurred within the 800 m Survey Area to the north of the Operational Corkey Windfarm but was beyond 1 km from both the existing and proposed turbines. Nearest breeding hen harrier and merlin were recorded more than 2 km away. Other successful breeding hen harrier and merlin locations were identified beyond the 2 km Survey Area to the north and north-east respectively. Peregrine falcons fledged three young within the 500 m Survey Area in one year of survey, but failed to breed in the other survey years and some flight activity was noted in the post-fledging period in the 500 m Survey Area during vantage point surveys.
- There were a range of species recorded in the Site and associated 500 m Survey Area, and the distribution and abundance of these varied between years of survey.
- There was considerable evidence of habituation to the Operational Corkey Windfarm including two target species, red grouse and snipe however the distribution and abundance of these varied between years.
- Wintering priority species were recorded widely within the 2 km Survey Area (including gulls, buzzard, kestrel, golden plover cormorants, heron, peregrine, snipe, hen harrier, red grouse and raven). Gulls and cormorants were typically associated with the nearby reservoir and there were no wintering swan or geese roosting or foraging areas recorded within the 2 km Survey Area. Greylag geese were recorded once flying north-south direction to the east of the 2 km Survey Area over winter and whooper swans and greylag geese were recorded roosting north-west of the 2 km Survey Area. This is a known traditional whooper swan (and greylag goose) roost. All observed goose/swan flights from this area departed or arrived to / from the north and / or north-west of the lakes.
- A hen harrier winter roost area was identified within the 2 km Survey Area and the maximum roost count was one bird and was used only infrequently over the winter survey period. Several other suitable areas of roosting habitat occurred within the 2 km Survey Area but no hen harriers were observed, although another two roosts were identified more than 2 km away and were recorded to have a maximum of two to three roosting harriers.

9.5 Assessment of Potential Effects

69. Following surveys and baseline findings (**Technical Appendix A9.1**) the assessment of potential effects considers the key ornithological receptors as outlined in **Table 9.5.**

Table 9.5: Summary of key ornithological receptors and sensitivity criteria and status

Species	Sensitivity	Population potentially affected	UK	NI	DISTRICT	LOCAL	Status	Season
Hen harrier	Very high	1-2 pairs within 5 km	575 pairs	46 pairs	25 pairs (SPA); 9 pairs (SPA)	-	SPA, Annex 1; red-listed	Breeding / Wintering
Merlin	Very high	1 pair within 5 km	1,162 pairs	32 pairs	8 pairs (SPA)	-	SPA, Annex 1; red-listed	Breeding / Wintering
Peregrine	Medium	1 pair within 2 km	1,769 pairs	83 pairs	-	-	Annex 1; green-listed	Breeding / Wintering
Buzzard	Low-Negligible	6-8 pairs within 2 km	57,000 - 79,000 pairs	1,000 - 2,000 pairs	-	-	Green-listed	Breeding / Wintering
Kestrel	Low	1-2 pairs within 2 km	46,000 pairs	1,000 pairs	-	-	Amber-listed	Breeding / Wintering
Sparrowhawk	Low	3-4 pairs within 2 km	35,000 pairs	2,000 pairs	-	-	Amber-listed	Breeding / Wintering
Raven	Low - Negligible	1-4 pairs within 2 km	7,400 pairs	400 pairs	-	-	Green-listed	Breeding / Wintering
Golden plover	Medium	Passage / over-wintering flocks	420,000 birds	20,000 birds	-	-	Annex 1; red-listed	Wintering
Curlew	High	1-3 pairs within 2 km	68,000 pairs	526 pairs	-	-	Red-listed; ecological sensitivity	Breeding
Snipe	Low	4-8 territories within 500 m	80,000 pairs / 1,100,000 birds	1123 pairs / 100,000 birds	-	-	Amber-listed, ecological sensitivity	Breeding / Wintering
Red grouse	Medium	3-8 territories within 500 m	230,000 pairs	220 pairs	-	-	Red-listed	Breeding / Wintering
Whooper swan	Medium	Maximum 45 birds within 5 km	15,000 birds	4,000 birds	-	-	Annex 1; amber-listed	Wintering
Greylag geese	Low	Maximum 245 birds within 5 km	230,000 birds	10,000 birds	-	-	Amber-listed	Wintering
Meadow pipit	Medium	6-7 territories within 500 m	2,000,000 pairs	100,000 pairs	-	266 - 371 territories	Red-listed	Breeding / Wintering

Species	Sensitivity	Population potentially affected	UK	NI	DISTRICT	LOCAL	Status	Season
Skylark	Medium	0-5 territories within 500 m	1,500,000 pairs	100,000 pairs	-	134-174 territories	Red-listed	Breeding / Wintering
Small passerines	Medium	Small numbers recorded in footprint	-	-	-	-	Red-listed	Breeding / Wintering
Small passerines	Low	Small numbers recorded in footprint	-	-	-	-	Amber-listed	Breeding / Wintering
Small passerines	Negligible	Small numbers recorded in footprint	-	-	-	-	Green-listed	Breeding / Wintering

9.5.1 Embedded Mitigation

70. The baseline ornithological survey data (**Technical Appendix A9.1**) was utilised to inform design iterations of the Development where possible to implement set-back (avoidance) distances of turbines and infrastructure from ornithological receptors. In the first instance the Development has sought to avoid significant effects by sensitive design of the windfarm layout and programme of works.

71. It is noted that, at the out-set and as discussed in consultation with NIEA (**Table 9.1**), several target species recorded breeding in the Site are noted to show considerable habituation in relation to tracks, infrastructure and the existing turbines.

72. It was necessary in this process to consider various sensitivities and also weighting in relation to other disciplines including landscape and visual assessment and wider ecology, particularly in relation to habitats and also the habituation observed in some species within the Operational Corkey Windfarm (i.e., snipe and red grouse) but also recognising that species abundance and/or distribution changes between years and total avoidance of all locations identified in a multi-year survey is impractical.

73. However, weighting was given to areas which were utilised between years and/or comprised relatively intact habitats. Ornithological information was utilised to inform part of the Development design; the Outline Decommissioning and Construction Environmental Management Plan (DCEMP; **Technical Appendix A3.1**) and the Draft Habitat Management Plan (**Technical Appendix A3.2**); which whilst targeted at habitat remediation and restoration will have considerable benefits to birds on the site, in particular snipe.

9.5.2 Potential Effect Types

74. Decommissioning/construction and operational activity presents three main risks to birds (Desholm, 2006[14]; SNH, 2017); namely 1) direct mortality due to collision; (2) direct loss of breeding, wintering and/or foraging habitat, due to the footprint of decommissioning/construction; and 3) displacement of birds as a result of increased disturbance and/or loss of suitable habitat and barrier effects due to the avoidance of turbine arrays.

75. Displacement can occur in two ways i) displacement from breeding and/or wintering locations, and/or ii) displacement from foraging areas. These potential effects are not mutually exclusive and may interact with one another to increase or decrease the severity of the effect. For example, reduced occurrence of species caused by habitat loss may decrease collision risk (Pearce-Higgins et al., 2009). Similarly, the absence of avoidance response of specific species or individual birds may increase collision risk (Drewitt & Langston, 2006[15]; McGuinness et al., 2015[16]).

76. The decommissioning/construction phases will occur over a short temporal period (weeks – months) whilst the operational phase will occur over several years. Effects are most likely to arise where spatial and/or temporal interactions occur between nesting, foraging, wintering or roosting habitats and windfarm developments. The key considerations for birds and windfarms are direct mortality; direct or indirect effects of disturbance; loss or fragmentation of breeding, wintering or foraging habitats as well as barrier effects.

9.5.2.1 Direct Mortality Effects

77. The mortality effects of windfarms on birds can be variable and may be affected by: season; topography; turbine metrics such as height, design and age; windfarm spatial arrangement; weather conditions; repowering; specific species' vulnerability or morphology; species' abundance and distribution; and the value or attractiveness of surrounding habitats.

78. Poorly sited developments can result in extensive mortality e.g. Smóla (Norway). Site specific mortality may be elevated and may be additive or compensatory to other types of mortality such as persecution (e.g. shooting or poisoning), predation or other types of collisions (e.g. vehicles, towers, buildings, power-lines). However, population effects or dynamics may occur for poorly manoeuvrable, rare, long-lived, low productivity species and may have wider effects than at the site of the collision e.g. migrants.

79. The potential effects of repowering on mortality rates appears variable, since repowering (i.e. increasing the capacity) of older turbines may change the collision risk for birds (Stewart et al., 2007[17]; Drewitt & Langston, 2008[18]) but there may be no discrete relationship with turbine height and power output (MW) (Pearce-Higgins et al., 2009; 2012).

80. Collision risk and/or collisions are therefore a complex interaction between multiple species characteristics and occurrence, environmental, and wind turbine / windfarm factors (see Wilson et al., 2015[19]). Windfarms may operate in combination with other mortality factors to exacerbate population declines which may change over time given the increasing numbers of turbines nationally and globally in line with important renewable energy policy.

9.5.2.2 Potential Direct & Indirect Displacement Effects

81. Displacement from breeding, wintering or foraging areas can occur as both as a result of both direct and indirect effects at windfarms. This can occur through direct loss, perturbation or changes to habitats i.e. loss of nesting, foraging or roosting habitat or indirectly through behavioural avoidance due to disturbance (Langston & Pullan, 2003[20]) and/or modification of the utility and quality of habitats (Arroyo et al., 2009[21]). Indirect effects may also be due to behavioural avoidance by individual birds of turbines at or a wider 'barrier effect' at windfarm(s) level (de Lucas et al., 2004[22]). This spatial avoidance may subsequently lead to localised population changes on abundance and/or distribution.

82. Displacement may not occur or its effects are negligible (Madders & Whitfield, 2006[23]; Devereux et al., 2008[24]; Douglas et al., 2011[25]); it may have negative impacts (Pearce-Higgins et al., 2009); or effects may be complex interactions between site-specific and species-specific metrics (Drewitt & Langston, 2006; Pearce-Higgins et al., 2009; 2012; Garvin et al., 2011[26]).

83. The direct habitat loss due to the footprint of decommissioning/construction is a relatively small area of land with a wider behavioural effect likely at a greater distance through avoidance. Displacement is a spatial response i.e. avoidance of infrastructure by a specified distance (Whitfield et al., 2008) although this can be variable between species and individuals. Displacement exhibits considerable intra-specific variation and, where it occurs, may extend from 25m to 1,000 m but that

[14] Desholm, M. (2006). Wind farm related mortality among avian migrants – a remote sensing study and model analysis. National Environmental Research Institute. 132 pp.
[15] Drewitt, A. L. & Langston, R. H. W. (2006). Assessing the impacts of wind farms on birds *Ibis* 148: 29-42.
[16] McGuinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S. & Crowe, O. (2015). Bird sensitivity mapping for wind energy developments and associated infrastructure in the Republic of Ireland. BirdWatch Ireland, Kilcoole
[17] Stewart, G.B., Pullin, A.S. & Coles, C.F. (2007). Poor evidence-base for assessment of windfarm impacts on birds. *Environmental Conservation* 34: 1-11.
[18] Drewitt, A. L. & Langston, R. H. W. (2008). Collision effects of wind-power generators and other obstacles on birds. *Annals of the New York Academy of Sciences* 1134: 233-266.
[19] Wilson, M, Fernández-Bellon, D., Irwin, S. & O'Halloran, J. (2015). The interactions between Hen Harriers and wind turbines. *Windharrier. Final project report, prepared by School of Biological, Earth & Environmental Sciences, University College Cork, Ireland*. PP95.
[20] Langston, R., & Pullan, J. (2003). Windfarms and birds: an analysis of the effects of wind farms on birds, and guidance on environmental assessment criteria and site selection issues.
[21] Arroyo, B., Amar, A., Leckie, F., Buchanan, G. M., Wilson, J. & Redpath, S. (2009). Hunting habitat selection by hen Harriers on moorland: Implications for conservation management. *Biological Conservation* 142: 586-596.
[22] de Lucas, M., Janss, G. E. & Ferrer, M. (2004). The effects of a wind farm on birds in a migration point: The Strait of Gibraltar. *Biodiversity & Conservation* 13: 395-407.
[23] Madders, M. & Whitfield, D. P. (2006). Upland raptors and the assessment of wind farm impacts. *Ibis* 148: 43-56.
[24] Devereux, C. L., Denny, M. J. H. & Whittingham, M. J. (2008). Minimal effects of wind turbines on the distribution of wintering farmland birds. *Journal of Applied Ecology* 45: 1689-1694.
[25] Douglas, D. J. T., Bellamy, P. E. & Pearce-Higgins, J. W. (2011). Changes in the abundance and distribution of upland breeding birds at an operational windfarm *Bird Study* 58: 37-43.
[26] Garvin, J. C., Jennelle, C. S., Drake, D. & Grodsky, S. M. (2011). Response of raptors to a windfarm. *Journal of Applied Ecology* 48: 199-209.

some species may not be affected (Douglas et al., 2011). Effects on some species may extend to a greater distance (see Ruddock & Whitfield, 2007; Whitfield et al., 2008).

84. Pearce-Higgins et al., (2009) found that there was no relationship with displacement and turbine size or power whilst Stewart et al., (2005) found that there does not seem to be an inter-relationship with abundance and turbine number. In this study only a weak relationship with power output was observed where lower (power) rated turbines had greater effects on bird abundance than higher rated turbines and that bird abundance was significantly affected by the life-span of the windfarm operation.

85. Some research indicates that some species may be affected (i.e. reduced occurrence and/or breeding density) up to 800 m away from turbines, tracks and/or windfarm infrastructure (Pearce-Higgins et al., 2009) with effects declining post-construction (Pearce-Higgins et al., 2012). There remains very little information on the long-term behavioural response of birds to windfarms (Stewart et al., 2007), although evidence is increasingly available (see Wilson et al., 2015; Fielding & Haworth, 2013; Sansom et al., 2016).

86. Six species in particular (golden plover, meadow pipit, skylark, snipe, curlew and wheatear) may avoid windfarms between 100 m and 800 m and may be reduced in breeding density up to 500 m away from turbines (Pearce-Higgins et al., 2009). Red grouse are not significantly affected (Pearce-Higgins et al., 2009; Douglas et al., 2011; Pearce-Higgins et al., 2012) and foraging activity by buzzards and hen harriers was considered to be reduced within the windfarm (Pearce-Higgins et al., 2009). In supporting information, Pearce-Higgins et al., (2012), found continued apparent negative impacts on waders, but re-iterated few impacts on red grouse and some species actually increased post- construction.

87. Displacement may affect breeding success in raptors (Bright et al., 2008[27]; Carrete et al., 2009[28]; Dahl et al., 2012[29]) although several studies show no detectable effects (see Wilson et al., 2015). There is mixed evidence of habituation, with some reviews (Stewart et al., 2005) suggesting that effects will persist throughout the operational period. Others suggest this may vary between species (Marques et al., 2014) but few studies have demonstrated this empirically (see Madsen & Boertmann, 2008[30]). Further research on habituation responses is desirable.

9.5.2.3 Potential Direct & Indirect Disturbance & Construction Effects

88. Several studies attribute much of the perturbation caused by wind energy developments to the construction phase (Garvin et al., 2011; Pearce-Higgins et al., 2012; Stevens et al., 2013[31]; see **Chapter 3**) although some species (particularly seabirds, waders and raptors) may be impacted in the long-term (Nygard et al., 2010[32]) with potential population effects. Other studies show that there are no detectable population level impacts (Devereaux et al., 2008; Pearce-Higgins et al., 2009; Fielding & Haworth, 2010; Douglas et al., 2011) particularly during operational phase although some species may be vulnerable to longer-term effects than others (Pearce-Higgins et al., 2012).

89. Disturbance is a key factor which can affect bird behaviour, physiology and spatial distribution (Ruddock & Whitfield, 2007; Tarjuelo et al., 2015[33]). The distance at which a species responds (e.g. by flushing) is often thought to indicate the sensitivity of the species to disturbance (Fernandez-Juricic et al., 2003[34]). Spatial buffers and/or temporal cessation of works are usually prescribed to protect birds from disturbance (Rodgers & Schwikert, 2003).

90. For larger species the flushing distances and consequently set-back distances are usually greater to protect them from human disturbance (Arroyo et al., 2006; Martinez-Abrain et al., 2010[35]) but can be variable between species and individuals (Ruddock & Whitfield, 2007). Typically, smaller species will be affected by activities within 25 – 100 m indirectly (Ruddock & Whitfield, 2007) and/or directly by any associated footprint of actual land-take or removal of vegetation during decommissioning / construction activities. Pearce-Higgins et al. (2012) indicates that most breeding bird populations recover post-construction excluding large waders specifically snipe and curlew.

91. An important consideration when assessing the potential effects of the decommissioning/construction phases of the Development is the spatial extent of activities at any one time. All planned activities (**Chapter 3**) would not take place simultaneously over the whole Site. Rather they would be more restricted to smaller areas of activity at any particular time. Since suitable habitat typically exists nearby the effects of short-term displacement will be minimised as birds are able to move away from the source of the disturbance during decommissioning/construction activity. Additionally, some impacts are known to decline after these phases and therefore only temporary for some species (Pearce-Higgins et al., 2012).

9.5.2.4 Potential Ancillary Effects

92. Other windfarm infrastructure such roads and powerlines may cause other effects for birds (Drewitt & Langston, 2008). This includes the facilitation of access to previously inaccessible areas via windfarm roads and tracks which may be used by recreational personnel and vehicles such as scramblers or motorbikes or turf extraction (see Ruddock et al., 2016[36]) and access management is key to reducing any likely disturbance.

93. Roads may increase fragmentation of habitats but may attract some species e.g. novel linear features which harriers may utilise for foraging (M. Ruddock, personal observation) or snipe for feeding (M. Ruddock, personal observation). Power-lines and any associated vegetation clearance may create fragmentation or barriers to movement (avoidance) and/or collision risks. Overhead power-lines and associated infrastructure (i.e. pylons or poles) may also act as perching locations for some species including nest predators such as corvids but can also cause electrocution. There are no additional overhead lines proposed at Corkey.

94. The main predicted effects during the operational phase on birds are from disturbance during maintenance operations, the avoidance and barrier effect of the turbines (i.e. causing displacement of flight activity) and direct mortality through collision. Therefore, all species recorded have been considered further in this Chapter for potential decommissioning/construction and/or operational risks.

9.5.3 Potential effects on breeding birds within 500 m of turbines and infrastructure footprint

95. Both the Operational Corkey Windfarm (baseline) and the proposed Development layout i.e. footprint of turbines (including rotor swept area) and access roads were mapped in ArcGIS 10.5 and buffered by 25 m. This footprint was super-imposed upon the aggregated breeding bird locations to establish which species were co-incident with the decommissioning / construction areas and might therefore be directly impacted during works. This analysis was also undertaken on the extant priority species locations to identify territories at risk of displacement. Published literature was reviewed to establish which of the species recorded within 500 m would be vulnerable to displacement (**Figures 9.41 – 9.48**).

96. There were six species recorded within the Operational Corkey Windfarm access track and turbine 500 m buffer in 2014 (**Technical Appendix 9.1, Figures 9.41 - 9.44**) namely stonechat (1 territory), wheatear (1 territory), meadow pipit (19 territory), wren (1 territory) and skylark (5 territories) and raven (non-breeding detection). Skylarks and are red-listed in the UK (Eaton et al., 2015) and meadow pipits are red listed in Ireland (Colhoun & Cummins, 2013). This was different in the proposed Development infrastructure footprint in 2014 (**Technical Appendix 9.1; Figures 9.41 – 9.44**) with 15 species recorded in the footprint and 25 m buffer namely blackbird (1 territory) goldfinch (1 territory), golden plover (non-breeding detection), hooded crow (1 territory), meadow pipit (25 territories), pied wagtail (1 territory), red grouse (1 territory), raven (non-breeding detection), skylark (10 territories), stonechat (1 territory), starling (non-breeding detection), swallow (1 territory), wheatear (1 territory), woodpigeon (1 territory) and wren (1 territory).

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[36] Ruddock, M., Mee, A., Lusby, J., Nagle, A., O'Neill, S. & O'Toole, L. (2016). The 2015 National Survey of Breeding Hen Harriers in Ireland. Irish Wildlife Manuals, No. 93. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

97. For stonechat, wheatear and wren there is no difference in the predicted displacement or disturbance since the numbers of territories are the same between the existing and proposed Development infrastructure, and therefore no greater effects could arise due to the Development. Four of the species detected were non-breeding and therefore no breeding displacement or disturbance effects could arise. There was a difference of six meadow pipit and five skylark territories between existing and proposed Development infrastructure. Six meadow pipit territories comprise only 1.6% of the 371 territories recorded locally within the 500 m Survey Area (**Technical Appendix A9.1**). Five skylark territories comprise only 2.8% of the 174 territories recorded locally within the 500 m Survey Area (**Technical Appendix A9.1**).

98. Red-listed species (Colhoun & Cummins, 2013 or Eaton *et al.,* 2015) detected in the wider 500 m turbine buffers for both existing and proposed Development turbines include golden plover, linnet, lesser redpoll, meadow pipit, red grouse, skylark and starling.

99. There were seven species recorded within the Operational Corkey Windfarm access track and turbine buffer in 2018 (**Technical Appendix 9.1, Figures 9.45 - 9.48**) namely hooded crow (non-breeding detection), pied wagtail (1 territory), meadow pipit (12 territory), wren (1 territory) and skylark (5 territories) and starling (non-breeding detection), snipe (1 territory). Skylarks and are red-listed in the UK (Eaton et al., 2015) and meadow pipits are red listed in Ireland (Colhoun & Cummins, 2013). This was different to the proposed Development infrastructure footprint in 2018 (**Technical Appendix 9.1; Figures 9.45 – 9.48**) with nine species recorded in the footprint and 25m buffer namely buzzard (non-breeding detection), lesser redpoll (1 territory), snipe (1 territory), hooded crow (1 territory), meadow pipit (19 territories), pied wagtail (1 territory), skylark (5 territories), wheatear (1 territory) and raven (non-breeding detection).

100. For pied wagtail and skylark there is no difference in the predicted displacement or disturbance since the numbers of territories are the same between the existing and proposed Development infrastructure, and therefore no greater impacts could arise due to the proposed Development. Four of the species detected were non-breeding and therefore no breeding displacement or disturbance impacts could arise. There was a difference of 12 meadow pipit territories between existing and proposed predictions. Twelve meadow pipit territories comprise 4.5%% of the 266 territories recorded locally within the 500 m Survey Area (**Technical Appendix A9.1**). There was no difference between estimates of skylark between existing and proposed footprints with five skylark territories each which comprises 3.7% of the 134 territories recorded locally within the 500 m Survey Area (**Technical Appendix A9.1**).

101. The footprint of the initial decommissioning/construction activities therefore could only directly affect a smaller sub-set of species and individuals, notably potential displacement or reduction in density of meadow pipits, wheatear, snipe (**Technical Appendix A9.1**; see Pearce-Higgins et al., 2009) which may be variable between years (**Table 9.6**).

Table 9.6 Predicted displacement of species (Pearce-Higgins et al., 2009) from within the 500 m buffer of existing and proposed Development infrastructure for data 2014 – 2019.[37]

Year / Site	Species	Average % reduction (range)	Number (n) within 500 m	Average remaining (n)	Maximum remaining (n)	Minimum remaining (n)	Ave. loss (n)	Min loss (n)	Max. loss (n)
2014 Existing	Snipe	47.5 (8.1-67.7)	4	2.1	3.7	1.3	1.9	0.3	2.7
2014 Existing	Curlew	42.4 (3.4-72.8)	0	0.0	0.0	0.0	0.0	0.0	0.0
2014 Existing	Meadow pipit	14.7 (2.7-25.1)	165	140.7	160.5	123.6	24.3	4.5	41.4
2014 Existing	Wheatear	44.4 (4.9-65.2)	3	1.7	2.9	1.0	1.3	0.1	2.0
2014 Proposed	Snipe	47.5 (8.1-67.7)	4	2.1	3.7	1.3	1.9	0.3	2.7
2014 Proposed	Curlew	42.4 (3.4-72.8)	0	0.0	0.0	0.0	0.0	0.0	0.0
2014 Proposed	Meadow pipit	14.7 (2.7-25.1)	182	155.2	177.1	136.3	26.8	4.9	45.7
2014 Proposed	Wheatear	44.4 (4.9-65.2)	3	1.7	2.9	1.0	1.3	0.1	2.0
2015 Existing	Snipe	47.5 (8.1-67.7)	7	3.7	6.4	2.3	3.3	0.6	4.7
2015 Proposed	Snipe	47.5 (8.1-67.7)	7	3.7	6.4	2.3	3.3	0.6	4.7
2016 Existing	Snipe	47.5 (8.1-67.7)	8	4.2	7.4	2.6	3.8	0.6	5.4
2016 Proposed	Snipe	47.5 (8.1-67.7)	8	4.2	7.4	2.6	3.8	0.6	5.4
2018 Existing	Snipe	47.5 (8.1-67.7)	4	2.1	3.7	1.3	1.9	0.3	2.7
2018 Existing	Curlew	42.4 (3.4-72.8)	0	0.0	0.0	0.0	0.0	0.0	0.0
2018 Existing	Meadow pipit	14.7 (2.7-25.1)	127	108.3	123.6	95.1	18.7	3.4	31.9
2018 Existing	Wheatear	44.4 (4.9-65.2)	0	0.0	0.0	0.0	0.0	0.0	0.0
2018 Proposed	Snipe	47.5 (8.1-67.7)	4	2.1	3.7	1.3	1.9	0.3	2.7
2018 Proposed	Curlew	42.4 (3.4-72.8)	0	0.0	0.0	0.0	0.0	0.0	0.0
2018 Proposed	Meadow pipit	14.7 (2.7-25.1)	134	114.3	130.4	100.4	19.7	3.6	33.6
2018 Proposed	Wheatear	44.4 (4.9-65.2)	1	0.6	1.0	0.3	0.4	0.0	0.7

[37] Footnote to Table 9.5; n = number of territories; the displacement calculations are utilised to establish the average, minimum and maximum displacement values which provide an average, maximum and minimum remaining number of territories

102. For several of these species there is a negligible difference in the number of territories recorded between the existing and proposed infrastructure and therefore no significant effects are predicted. Differences, where they do occur, relate to a very small number of territory locations (typically 1-2 of relatively common species). Modelling displacement within 500 m for meadow pipit (Pearce-Higgins et al., 2009) reveals that within years there was negligible difference between the maximum predicted displacement for existing (baseline) turbines compared to proposed turbines (2014: 41.4 to 45.7 territories = 4.3

territories difference; 2018: 31.9 to 33.6 territories = 1.7 territories difference). Wheatear were no different in 2014 but a maximum difference of 0.7 territories was recorded in 2018.

103. The majority of key target breeding species (**Technical Appendix A9.1; Table 9.1**) which occurred within the vicinity and wider hinterland of the Development are avoided by appropriate buffers (**Figure 9.49 – 9.53**) with no priority raptor species occurring within 500 m of either the existing or the proposed turbines, although both buzzard and peregrine were recorded within 500 m of the existing and/or proposed access tracks. Buzzard are recorded closer to the existing access track infrastructure than the proposed Development access track infrastructure in all years of survey (**Figures 9.49 – 9.53**) whilst peregrine are closer to the proposed access track infrastructure they also occur within a highly modified landscape which includes for existing roads, quarries and buildings, which lie within closer distances than the proposed Development access track in this instance. There are therefore no potential significant displacement or disturbance impacts predicted to arise to any breeding raptor species.

104. Snipe and red grouse territories do occur within the existing Site, and were recorded to fledge young within the Operational Corkey Windfarm in 2014; 2016 and 2018 (M. Ruddock, personal observation). Snipe occurred between 75m and 1.9km away from existing turbines and between 76m and 2.2 km from proposed Development turbine locations. For all snipe recorded in most years of survey, the proposed Development turbines are located, on average, further away from snipe territories than the existing turbines (**Table 9.7**). For snipe which occurred within the 500 m turbine buffers, the distances these were located away from turbines is greater annually, and on average, for the proposed turbines than existing turbines (**Table 9.6**) i.e. set-back (avoidance) distances is increased with the proposed turbines.

Table 9.7 Distances (m) of snipe recorded in each year of survey to nearest existing and proposed turbines.

Year	Existing turbines (all SN)	Existing turbines (SN within 500 m)	Proposed turbines (all SN)	Proposed turbines (SN within 500 m)
2014	640.4	223.9	691.3	299.7
2015	543.4	248.9	543.5	270.7
2016	596.6	178.7	599.9	177.3
2018	948.7	253.0	893.2	280.9
Average	682.3	226.1	682.0	257.2

105. Modelling of displacement (Pearce-Higgins et al., 2009) for snipe (**Table 9.6**) reveals that there is no difference in the predictions for displacement in any year of survey between the existing and proposed 500 m buffers i.e. the same number of territories, although these change between years with a range of between four and eight snipe territories (**Table 9.6**). Therefore there are no potential significant displacement or disturbance risks or effects predicted to arise to snipe when compared to the baseline comprising the existing turbines and infrastructure, subject to avoidance of disturbance factors during construction (**Section 9.7**).

106. There are no curlew territories located within 500 m, therefore initial Pearce-Higgins et al., (2009) predictions indicate no curlew will be displaced or reduced in density (Pearce-Higgins et al., 2009; **Table 9.6**). Furthermore, the existing turbines (range 1.4km – 2.6km) and/or proposed turbines (range 1.1 km – 2.7 km) are all located more than 1 km from the nearest curlew territories. Therefore, it is confirmed that no density reduction or displacement could occur (Pearce-Higgins et al., 2009; Whitfield et al., 2010). There are therefore no potential significant displacement or disturbance risk or effects predicted to arise to breeding curlew.

107. Most vulnerable to displacement or disturbance are the ground-nesting species, e.g., meadow pipit, skylark, red grouse, snipe wheatear, wren, (**Figures 9.41 – 9.44**) but the distribution and abundance of these species varies between years (see also **Figures 9.45 – 9.48**). Other species including blackbird, goldcrest, hooded crow and pied wagtail are less vulnerable to direct impacts since they are more liable to be nesting in buildings, man-made structures and/or trees and/or hedgerows or scrub and often along vegetated edges associated with the existing tracks and infrastructure (**Figure 9.41 – 9.48**).

108. These latter locations can readily be protected from direct impacts during the decommissioning/construction phases by the protection of key breeding habitats and temporal restrictions on construction periods (**Section 9.7**). Several of the species territories recorded are associated with the lower altitude improved agricultural habitat mosaics near the site entrance and existing hedgerows along roads, field margins and around buildings, all of which will be retained and/or reinstated (**Section 9.7; Technical Appendix A3.2**). Most small passerines were recorded in grass / moorland pasture which contains meadow pipit and skylark.

9.5.4 Potential effects on wintering birds within 500 m of turbines and infrastructure footprint

109. The same analysis was completed on aggregated wintering bird species locations as outlined in **Section 9.5.3** above and mapped for wintering bird survey data (**Figures 9.54 & 9.55**).

110. During the winter few species are constrained to spatial locations and as such are much less vulnerable to displacement or disturbance than during the nesting season as they can readily move to alternative habitats. Red-listed species (Colhoun & Cummins, 2013 or Eaton *et al.,* 2015) detected in the wider 500 m turbine buffers include golden plover, grey wagtail, linnet, meadow pipit, mistle thrush, red grouse, skylark, starling and woodcock.

111. There were eight wintering species recorded within the Operational Corkey Windfarm buffer in 2014 (**Figure 9.49**) namely kestrel (1 location), meadow pipit (3 locations), raven (1 location), rook (1 location), stonechat (1 location), snipe (1 location) wheatear (1 location) and wren (1 location). Meadow pipit is red-listed in Ireland (Colhoun & Cummins, 2013). There was a wider presence of species within the 500 m turbine buffer (**Technical Appendix A9.1**), but no additional species were located within the track buffer.

112. There were fewer wintering species (n = 6) recorded within the proposed Development access track and turbine buffer in 2014 (**Figure 9.49**) namely hooded crow (2 locations), kestrel (1 location), magpie (1 location), meadow pipit (7 locations), rook (1 location) and snipe (1 location). Meadow pipit is red-listed in Ireland (Colhoun & Cummins, 2013). There was a wider presence of species within the 500 m turbine buffer (**Technical Appendix A9.1**), but no additional species were located within the track buffer.

113. There was some variation between survey years with nine species recorded within the existing access track and turbine buffer in 2018 (Figure 9.50) including golden plover (1 location), hooded crow (1 location), magpie (1 location), meadow pipit (5 locations), pied wagtail (1 location), raven (1 location), snipe (1 location), wheatear (1 location) and wren (1 location). There were two red-listed species recorded golden plover and meadow pipit (Colhoun & Cummins, 2013).

114. Within the proposed access track and turbine buffer in 2018 there were fewer species recorded (n = 8) with golden plover (2 locations), hooded crow (1 location), meadow pipit (5 locations), pied wagtail (1 location), red grouse (1 location), snipe (1 location), wheatear (1 location) and wren (1 location). There were three red-listed species recorded golden plover, red grouse and meadow pipit (Colhoun & Cummins, 2013).

115. The two wader species recorded during the winter namely golden plover and snipe recorded within the 500 m Survey Area (**Technical Appendix A9.1**) and track buffers (**Figures 9.49 & 9.50**). Golden plover were located mostly in flight near the Site, including in and around existing turbines, but were also recorded roosting at a number of locations in the Survey Areas immediately adjacent, and within the Operational Corkey Windfarm infrastructure, at the edge and in the middle of existing windfarm tracks (M. Ruddock, personal observation) whilst the snipe were often located along existing ditches and drainage channels, and edges of existing windfarm tracks and hard-standing areas (**Figures 9.49 & 9.50**). Research indicates a variable response of (breeding) golden plover (Sansom et al., 2016; Douglas et al., 2011).

116. The footprint of decommissioning/construction therefore will only theoretically directly affect a sub-set of species and individuals. The locations can readily be protected from direct impacts during the decommissioning / construction phases by the protection of key habitats. Several of the species territories recorded are associated with the lower altitude improved agricultural habitat mosaics adjacent to the proposed site entrance and existing hedgerows along roads, field margins and around buildings all of which will be retained and/or reinstated and few are within the remaining proposed Development footprint per se, whilst those in open habitats can readily relocate to alternative adjacent areas during the winter.

9.5.5 Potential effects of collision on birds within 500 m of turbines

117. There were a maximum of 17 target species detected flying within the 500 m Survey Area during the breeding season, buzzard, cormorant, common gull, curlew, golden plover, greater black-backed gull, heron, hen harrier, kestrel, lesser black-backed gull, mallard, merlin, peregrine, red grouse, raven, sparrowhawk and snipe although the detection rates and occurrence varied between years (**Technical Appendix A9.1**). There were six of the detected species recorded breeding

within 2-5 km of turbines and may therefore have a pathway to collision risk - buzzard, curlew, hen harrier, kestrel, peregrine, raven, red grouse, sparrowhawk and snipe and therefore regular flights of the other species recorded are less likely.

118. Most frequently occurring species in all years of study were buzzard, lesser black-backed gull and raven (**Technical Appendix A9.1**) and, in one year, cormorant were also regularly detected. The gulls and ravens were frequently recorded to be present on the Site and wider agricultural landscape scavenging on available carrion. Some of the species detected including mallard, heron, cormorant and the gulls were often associated with movements to / from the Altnahinch Dam although flights predominantly only just passed through the outer perimeter of the 500 m Survey Area and thus were recorded largely beyond 500 m turbine buffers and therefore of negligible risk for collision. There were no raptor nests/territories recorded within the 500 m turbine buffers and nest locations will therefore be unaffected by the Development (**Section 9.6.1; Figure 9.20 – 9.26; 9.39**). Four Target 1 species were recorded within potential collision height bands, peregrine, hen harrier, merlin and curlew.

119. During the winter the occurrence of most species declined (**Technical Appendix A9.1**), notably curlew and common gull, although there were additional species detected over-winter including woodcock and greylag goose. There were a maximum of 15 target species detected flying within the 500 m Survey Area during the wintering season buzzard, cormorant, golden plover, greylag goose, heron, hen harrier, kestrel, lesser black-backed gull, merlin, peregrine, red grouse, raven, sparrowhawk, snipe and woodcock although the detection rates and occurrence varied between years (**Technical Appendix A9.1**).

120. Small numbers of geese (greylag) and swans (mute and whooper) are recorded to occasionally utilise the wider hinterland area during wintering / migration periods including for roosting, however no flights passed within the 500 m buffers from either existing or proposed turbines and therefore no collision is predicted. There were hen harrier roost sites recorded within 2 km and beyond the 2 km Survey Area (**Technical Appendix A9.1**) and these locations, which varied between years will be unaffected by the existing and/or proposed turbines and associated infrastructure. These harrier and/or swans / goose wintering locations were not utilised throughout the winter and are considerably beyond the Development footprint therefore the risk of large aggregations for winter roosting or traditional commuting or migratory corridors means that collisions are unlikely.

121. The key risk species for collision are therefore identified as the peregrine falcon, hen harrier, merlin and curlew, however, this risk varies spatially as well as temporally, i.e., between years and seasons (**Section 9.6.4; Technical Appendix A9.1; A9.3**). In consultation with NIEA (**Table 9.1**), it was agreed to review the spatial occurrence (see **Figures 9.14 – 9.16 & 9.33 – 9.35**) and collision risk for buzzard, kestrel and raven although it was confirmed that detailed height band and flight duration information is not recorded for these secondary species (**Technical Appendix A9.1; Table 9.1**). It was also agreed with NIEA (**Table 9.1**) and confirmed during Scoping that collision risk modelling for golden plover could be scoped out of collision risk assessment given the species manoeuvrability and published research on this species (**Section 9.3.3**).

9.5.6 Collision risk modelling (CRM)

122. This section sets out collision models and assessment findings for each receptor and concludes that the Development presents no significant risk of collision to ornithological receptors. There have been no documented collisions recorded at the Corkey windfarm despite an on-going monitoring, recording and reporting protocol operated by ScottishPower Renewables since 2010 (see also **Technical Appendix A9.4**). When considering the operational phase of the Development in terms of collision risk the assessment considers the operational phase to be permanent but reversible, with an illustrative 30-year period when considering the magnitude of collision estimates.

9.5.6.1 Peregrine falcon

123. There was an active peregrine nest site within 500 m Survey Area, although this was not successful in recent years of survey (**Technical Appendix A9.1**). This is a traditional nesting site which is intermittently successful in fledging young (M. Ruddock, personal observation). This territory appears to be the origin of all the peregrine flights observed during vantage points with more observations in later summer after young fledglings began travelling further afield during 2014 – 2015 surveys. Peregrine flights only occasionally passed through the respective 500 m turbine buffers (**Technical Appendix A9.3; Table A9.2; A9.3**) and there was some variation in potential collision risk heights at the existing and proposed sites given the different turbine metrics.

124. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.26 peregrines (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.15% (i.e. 0.26 divided by 166 – 2 x 83 pairs – peregrines) from the Northern Ireland adult population (Wilson et al., 2018)[38]. With the recommended avoidance, for peregrines as 98% (Provan & Whitfield, 2006) this declines to a negligible 0.005 peregrines (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 3.8 years, but with 98% avoidance one bird every 189.3 years (**Technical Appendix A9.3**).

125. The collision risk predicted in 2014-2015 for the proposed Development envelope equates to up to 0.46 peregrines (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.27% (i.e. 0.46 divided by 166 – 2 x 83 pairs – peregrines) from the Northern Ireland adult population (Wilson et al., 2018). With the recommended avoidance, for peregrines as 98% (Provan & Whitfield, 2006) this declines to a negligible 0.009 peregrines (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 2.2 years, but with 98% avoidance one bird every 108.4 years (**Technical Appendix A9.3**).

126. There was some variation between survey years and activity was lower during the 2018 – 2019 surveys. With no avoidance the activity during this period equates to predicted mortality of approximately one bird every 11.6 years, but with 98% avoidance one bird every 579.9 years for existing turbines (**Technical Appendix A9.3**) and approximately one bird every 8.2 years, but with 98% avoidance one bird every 409.8 years for the proposed turbines. Average collision risk as predicted by Band et al., (2007) models is actually lower for peregrine falcons in the proposed Development (9.9%) compared to the Operational Corkey Windfarm (10%).

127. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to peregrine falcons from collision throughout the operational phase.

9.5.6.2 Hen harrier

128. Hen harriers that were recorded were typically foraging and flying at low-level and occurred infrequently and the majority of sightings being beyond the respective 500 m turbine buffers (**Technical Appendix A9.3; Figure 9.56 & 9.57**). Whilst breeding and roosting sites were recorded in the hinterland and typically beyond 2 km (**Technical Appendix A9.1**) there were no regular activity or spatial patterns observed for hen harriers utilising the existing and/or proposed windfarm sites at Corkey. There was occasional usage which varied between years and season (**Technical Appendix A9.1**). There is no associated risk of displacement or direct impacts on hen harriers at the observed set-back distances although whilst some flights occurred at potential collision height, collision risk modelling is conducted accordingly.

129. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.18 hen harrier (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.2% (i.e. 0.18 divided by 92 – 2 x 46 pairs – hen harrier) from the Northern Ireland adult population (Wotton et al., 2018[39]). With the recommended avoidance, for hen harrier as 99% (Provan & Whitfield, 2006; Whitfield & Madders, 2006; SNH 2014; 2017) this declines to a negligible 0.002 hen harrier (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 5.5 years, but with 99% avoidance one bird every 546.4 years (**Technical Appendix A9.3**).

130. The collision risk predicted in 2014-2015 in the proposed Development envelope equates to up to 0.04 hen harriers (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.04% (i.e. 0.04 divided by 92 – 2 x 46 pairs – hen harrier) from the Northern Ireland adult population (Wotton et al., 2018). With the recommended avoidance, for hen harrier as 99% (Provan & Whitfield, 2006; Whitfield & Madders, 2006; SNH 2014; 2017) this declines to a negligible 0.0005 hen harriers (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 22.4 years, but with 99% avoidance one bird every 2,235.1 years (**Technical Appendix A9.3**).

131. There was some variation between survey years (**Technical Appendix A9.1**) and there were no hen harrier flights recorded within potential collision risk height during 2018 – 2019 (**Table A9.3**). Therefore, no collision could occur and no collision risk modelling is not required for this period since all flights were less than 15m a.g.l. and no theoretical or actual risks could occur.

[38] Wilson, M.W., Balmer, D.E., Drewitt, A., Francis, I., Jones, K., King, A., Raw, D., Rollie, C.J., Ruddock, M., Smith, G.D., Stevenson, A., Stirling-Aird, P.K., Wernham, C.V. and Noble, D.G. (2018). The breeding population of Peregrine Falcon *Falco peregrinus* in the UK, Isle of Man and Channel Islands in 2014. Bird Study 65: 1- 19.

[39] Wotton, S., Bladwell, S., Morris, N., Raw, D., Ruddock, M., Stevenson, A., Stirling-Aird, P. & Eaton, M. (2018) Status of the Hen Harrier *Circus cyaneus* in the UK and Isle of Man in 2016. Bird Study 65: 145-160

Average collision risk as predicted by Band et al., (2007) models is marginally higher for hen harrier in the proposed Development envelope (11.8%) compared to the Operational Corkey Windfarm envelope (11.5%). However, the overall collision estimates are lower for the proposed Development than the Operational Corkey Windfarm in the site based models (**Technical Appendix A9.3**) and there is therefore no significant risk to hen harriers from collision. Pearce-Higgins et al., (2009) indicates that hen harrier occurrence in/around windfarms may be altered (displaced) by an average of 52.5% (range -1.2% to 74.2%), therefore indicating that there may be a reduced level of activity (i.e. behavioural avoidance), and further reducing collision risk by up to 74%.

132. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to hen harrier from collision throughout the operational phase.

9.5.6.3 Merlin

133. There were a small number of merlin recorded during the surveys, and were largely low-flying and/or beyond the respective 500 m turbine buffers (**Technical Appendix A9.3; Figure 9.56 & 9.57**). Whilst breeding sites were identified in the hinterland and typically beyond 2 km (**Technical Appendix A9.1**) there was no regular activity or spatial patterns observed for merlin utilising the existing and proposed windfarm sites. There was occasional usage of the site which varied between years and season (**Technical Appendix A9.1**). There is no associated risk of displacement or direct impacts on merlin at the observed set-back distances, despite this, some flights occurred at potential collision height, therefore collision risk modelling is conducted accordingly.

134. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.04 merlin (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.06% (i.e. 0.04 divided by 64 – 2 x 32 pairs – merlin) from the Northern Ireland adult population (Ewing et al., 2011[40]). With the recommended avoidance, for merlin as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.0008 merlin (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 24.6 years, but with 98% avoidance one bird every 1,228.3 years (**Technical Appendix A9.3**).

135. The collision risk predicted in 2014-2015 within the proposed Development envelope equates to up to 0.07 merlin (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.1% (i.e. 0.07 divided by 64 – 2 x 32 pairs – merlin) from the Northern Ireland adult population (Ewing et al., 2011). With the recommended avoidance, for merlin as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.001 merlin (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 14.9 years, but with 98% avoidance one bird every 745.3 years (**Technical Appendix A9.3**).

136. There was some variation between survey years (**Technical Appendix A9.1**) and there were no merlin flights recorded within potential collision risk height during the 2018 – 2019 surveys (**Table A9.3**). Therefore, no collision could occur and no collision risk modelling undertaken since all flights were less than 15 m a.g.l. and no theoretical or actual risks could occur. Average collision risk as predicted by Band et al., (2007) models is marginally higher for merlin in the proposed Development envelope (9.8%) compared to the Operational Corkey Windfarm envelope (8.5%).

137. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to merlin from collision throughout the operational phase.

9.5.6.4 Curlew

138. Curlew that were recorded were typically flying at relatively low-level and occurred infrequently and the majority of sightings being beyond the respective 500 m turbine buffers (**Technical Appendix A9.3; Figure 9.56 & 9.57**). Whilst breeding and roosting sites were recorded in the hinterland including in the 800 m Survey Area (in 2014) but these were typically located beyond 1 km (see Pearce-Higgins et al., 2009) or more away from turbines (**Technical Appendix A9.1**) there were no regular activity or spatial patterns observed for curlew utilising the existing and/or proposed windfarm sites. There was occasional usage of the site by localised pairs which varied between years and season (**Technical Appendix A9.1)**.

139. In particular it is noted that curlew have declined in the locality since surveys commenced in 2014 (**Technical Appendix A9.1**). There is no associated risk of displacement or direct impacts on curlew at the observed set-back distances (Pearce-Higgins et al., 2009) despite this some flights occurred at potential collision height, therefore collision risk modelling is conducted accordingly.

140. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.41 curlew (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.04% (i.e. 0.41 divided by 1,052 – 2 x 526 pairs – curlew) from the Northern Ireland adult population (Colhoun et al., 2015). With the recommended avoidance, for curlew as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.008 curlew (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 2.5 years, but with 98% avoidance one bird every 123.2 years (**Technical Appendix A9.3**).

141. The collision risk predicted in 2014-2015 within the proposed Development envelope equates to up to 0.28 curlew (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.03% (i.e. 0.28 divided by 1,052 – 2 x 526 pairs – curlew) from the Northern Ireland adult population (Colhoun et al., 2015). With the recommended avoidance, for curlew as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.006 curlew (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 3.5 years, but with 98% avoidance one bird every 177.2 years (**Technical Appendix A9.3**).

142. There was some variation between survey years (**Technical Appendix A9.1**) and there were no curlew flights recorded within potential collision risk height during the 2018 – 2019 surveys (**Table A9.3**). Therefore no collision could occur and no collision risk modelling has been undertaken (**Technical Appendix A9.1**) as no theoretical or actual risks could occur. Average collision risk as predicted by Band et al., (2007) models is lower for curlew in the proposed Development envelope (9.2%) compared to the Operational Corkey Windfarm envelope (8.5%). Thus, overall for curlew there is a reduction in potential collision risk for the proposed Development.

143. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to curlew from collision throughout the operational phase.

9.5.6.5 CRM for other species

144. Key issues discussed with NIEA Natural Heritage (**Table 9.1**) in relation to collision risk modelling was the agreement that no CRM was required for golden plover but also that kestrel, raven and buzzard activity was of interest and NIEA requested that further details be presented and/or a collision risk model undertaken. It was noted that this was caveated recognising that these were secondary species during recording (**Technical Appendix A9.1**).

145. As detailed in the methods section of the technical report (**Technical Appendix A9.1**) certain species are prioritised during vantage point observations for recording purposes (**Table 9.1**). Flight trajectories, duration and heights are recorded in a hierarchical method in order that high risk species e.g. Annex 1; red-listed or species vulnerable to collision are the focus of the observer. Thus, species like hen harrier, merlin and swans are prioritised and observer efforts focussed on these, in particular to avoid long recording periods of more common or less vulnerable species like ravens, or buzzards they are typically treated as secondary species (see both SNH, 2005 & 2013).

146. It is noted that, as per SNH guidance and general best practice guidance, detailed field monitoring of secondary species can detract and/or distract from the monitoring of primary species and would always caution against observers trying to record too many species. However, as a matter of course observers at Bird Surveyors Ltd record the height band range of all detected species and flight trajectory for the secondary species, particularly raptors (see **Technical Appendix A9.1**) and/or record additional information on maps and recording forms. This information was additionally digitised as requested by NIEA and has been presented (**Technical Appendix A9.1; Figures 9.14 – 9.16 & 9.33 – 9.35**).

147. Therefore, whilst the requested information for collision risk models for buzzard, kestrel, and raven would be atypical, some further information on flight intervals (five minute intervals, recorded to the nearest minute), flying height (sub-sampled) and flight routes are provided for buzzard, kestrel and raven (**Technical Appendix A9.1; Figures 9.14 – 9.16 & 9.33 – 9.35**). Height bands are selected identical to the risk bands as per turbine metrics (<15; 15-25 m; 25-50 m; 50-75 m, 75-100 m; 100-

[40] Ewing, S.R., Rebecca, G.W., Heavisides, A., Court, I.R., Lindley, P., Ruddock, M., Cohen, S. & Eaton, M.A. (2011). Breeding status of Merlins Falco columbarius in the UK in 2008. Bird Study 58: 379-389.

125 m; 125-140 m; >140 m) with the bands 15 – 75 m used to define the risk window (rotor floor and ceiling respectively) for existing turbines and 15 – 140 m used to define the risk window (rotor floor and ceiling respectively) for proposed turbines.

148. The species priority list utilised in this study are based on composite measures of legislative protection e.g. Annex 1 EU protected species, conservation status (Colhoun & Cummins, 2013; Eaton et al., 2015), vulnerability to collision (e.g. swans with poor manoeuvrability) or displacement and propensity to consume observer observation effort (e.g. buzzards or ravens). Whilst this system does not diminish the importance of each individual species, the methods recognise that observers can realistically only record specific information during each observation. This hierarchical recording methodology is recognised best practice for wind farm vantage point observations (SNH, 2005; 2013; 2017) specifically to minimise observer errors or detections.

149. Nevertheless, information presented here was extracted from original recording forms for three of these species concurs that there were 19 (2014-2015) and 53 (2018-2019) detections of buzzards, 11 (2014-2015) and nine (2018-2019) detections of kestrel and 164 (2014-2015) and 135 (2018-2019) detections of raven. It is also noted that all of the red grouse, snipe and sparrowhawk detected were either flying <15m a.g.l. or were heard calling only from the ground (**Technical Appendix A9.1**). Therefore there is no associated collision risk for red grouse, snipe or sparrowhawk and no further collision risk modelling was conducted on these species.

9.5.6.6 Buzzard

150. The majority of the buzzard activity was centred on the nearest breeding territories (Mallaboy; Gruig; Ballure and Corkey; **Technical Appendix A9.1; Figure 9.14 & 9.33**) and occasional flights are made into the area by the pairs at Slieveanorra Forest (**Figure 9.14 & 9.33**). Some individuals may use the ridge to obtain lift for foraging, displaying and commuting, but the majority of all buzzard flight activity is in the wider 500 m Survey Area rather than through or over the core Site and existing or proposed turbine locations (**Technical Appendix A9.1)** which minimises extant risk.

151. Buzzard flights occurred both inside and outside the potential collision risk height (**Technical Appendix 9.3; Table 9.21 & 9.22**). Since methods utilised here for CRM do not direct the use of timed flights by using the five minute interval to the nearest minute it must be noted that this method would considerably over-estimate collisions and therefore whilst further collision risk modelling is undertaken (**Technical Appendix A9.3**) these are only indicative and may be at least 5-fold over-estimated since recording was at five minute intervals.

152. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.8 buzzard (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.02% (i.e. 0.8 divided by 4,000 – 2 x 2,000 pairs – buzzard) from the Northern Ireland adult population (Musgrove et al., 2013[41]) or 0.0005% of the UK population (79,000 pairs / 158,000 birds). With the recommended avoidance, for buzzard as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.016 buzzard (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 1.2 years, but with 98% avoidance one bird every 61.9 years (**Technical Appendix A9.3**).

153. The collision risk predicted in 2014-2015 at the proposed Development envelope equates to up to 2.7 buzzard (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.07% (i.e. 2.7 divided by 4,000 – 2 x 2,000 pairs – buzzard) from the Northern Ireland adult population (Musgrove et al., 2013) or 0.002% of the UK population (79,000 pairs / 158,000 birds). With the recommended avoidance, for buzzard as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.05 buzzard (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 0.4 years, but with 98% avoidance one bird every 18.1 years (**Technical Appendix A9.3**).

154. There was some variation between survey years and activity was higher during 2018 – 2019 surveys. With no avoidance the activity equates to predicted mortality of approximately one bird every 0.3 years, but with 98% avoidance one bird every 13.2 years for existing turbines (**Technical Appendix A9.3**) and approximately one bird every 0.1 years, but with 98% avoidance one bird every 6.6 years for existing turbines. Average collision risk as predicted by Band et al., (2007) models is lower for buzzards in the proposed Development (11.2%) compared to the Operational Corkey Windfarm (11.7%).

155. Buzzards are not considered particularly vulnerable to collision (Whitfield & Madders, 2006) and no specific avoidance measures have been established for them. In Wales, they will breed in close proximity to windfarms although some collisions have occurred (K. Duffy, personal communication & M. Ruddock, personal observation) and equally buzzards have been recorded to display in the vicinity of windfarms and even perch on nacelles when blades are not turning without observations of mortality (M. Ruddock, personal observation).

156. Pearce-Higgins et al., (2009) indicates that buzzard occurrence in/around windfarms may be altered (displaced) by an average of 41.4% (range 16.0% to 57.8%), therefore indicating that there may be a reduced level of activity (i.e. avoidance), and further reducing collision risk by up to 57%. In addition, the flights utilised here were all the flights recorded within the survey buffers (not only turbine buffers and thus further over-estimate collision risk estimates. Only a proportion of the buzzard flights utilised in collision risk estimate in 2014-2015 were recorded inside the existing (23%) and proposed (23%) turbine 500 m buffers and a higher proportion in 2018-2019 inside the existing (40%) and proposed (42%) turbine 500 m buffers. Thus, a further reduction in risk is likely of approximately 58-77% from the estimates provided in **Technical Appendix A9.3**.

157. A study by Musgrove et al., (2013) estimated that the UK population of buzzards was 57,000 – 79,000 pairs (with 1,000 – 2,000 estimated for Northern Ireland). On the basis of the above any collision rates at the proposed Development would confirm that a negligible proportion of the buzzards or kestrels may be affected from the UK population. No buzzards nested within 1 km of the proposed Development turbines, indeed the majority were recorded more 2 km of the proposed turbines, therefore actual risks for this species of displacement and/or collision are considered low, but will continue to be monitored as part of the monitoring protocol outlined here (**Section 9.7; Technical Appendix A9.4**).

158. Any collision risk estimate for these secondary species does not take into account the spatial preferences and/or usage of the site which shows that activity is primarily away from the proposed area of the turbines (**Figures 9.14 & 9.33**), and located around areas of identified breeding territories (**Technical Appendix A9.1**) and also it appears that this species is exhibiting avoidance of the existing turbines (**Figure 9.14 & 9.33**) therefore collision rates are likely to be considerably lower than any predicted rate and over-estimated by the use of the five minute interval timings and inclusion of all flights in the indicative collision risk models (**Technical Appendix A9.3**).

159. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to buzzard from collision throughout the operational phase.

9.5.6.7 Kestrel

160. Kestrels occurred within the 500 m Survey Area for 12 five-minute intervals during the vantage point surveys in 2014-2015 and there were fewer detections in 2018-2019 (n = 10). These birds occurred predominantly over the eastern and north eastern parts of the 500 m Survey Area (**Technical Appendix A9.1; Figures 9.15 & 9.34**). The activity centres largely correspond to the proximity of nearest known territories at Slieveanorra Forest respectively and more occasional activity from the pair located around Corkey quarry. The site is occasionally used for foraging, most activity was in the vicinity of VP2 and VP3 (**Figure 9.1**) and birds appear to be using the area at the northern end of the 500 m Survey Area based on proximity to the nearest nest sites (**Figures 9.20 – 9.24 & 9.39**), although they were recorded to fly within the area of the existing windfarm (**Figures 9.15 & 9.34**). The operational turbines at Gruig windfarm and appear closer to the kestrel activity than at the existing turbines at Corkey.

161. Kestrel flights occurred both inside and outside the potential collision risk height (**Technical Appendix 9.3; Table 9.22 & 9.23**) within a range of height bands and were recorded between 55-64% within collision risk height for the existing turbines and 55-73% at proposed turbines. Therefore c. 37-45% of flights were at no risk of collision. Since methods utilised here for CRM do not direct the use of timed flights by using the five-minute interval to the nearest minute it must be noted that this method would considerably over-estimate collisions and therefore whilst further collision risk modelling is undertaken (**Technical Appendix A9.3**) these are only indicative and may be at least 5-fold over-estimated since recording was at five minute intervals.

162. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 0.8 kestrel (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.04% (i.e. 0.8 divided by 2,000 – 2 x 1,000 pairs – kestrel) from the Northern Ireland adult population (Musgrove et al., 2013) or 0.0009% of the UK population (46,000 pairs / 92,000 birds). With the recommended avoidance, for kestrel as 95% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.04 kestrel (Technical Appendix A9.3). With no avoidance this equates to approximately one bird every 1.3 years, but with 95% avoidance one bird every 25.8 years (**Technical Appendix A9.3**).

[41] Musgrove et al., (2013). Population estimates of birds in Great Britain and the United Kingdom. British Birds 106: 64–100

163. The collision risk predicted in 2014-2015 at the proposed Development envelope equates to up to 1.4 kestrel (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 0.07% (i.e. 1.4 divided by 2,000 – 2 x 1,000 pairs – kestrel) from the Northern Ireland adult population (Musgrove et al., 2013) or 0.002% of the UK population (46,000 pairs / 92,000 birds). With the recommended avoidance, for kestrel as 95% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.07 kestrel (**Technical Appendix A9.3)**. With no avoidance this equates to approximately one bird every 0.7 years, but with 95% avoidance one bird every 13.9 years (**Technical Appendix A9.3**).

164. There was some variation between survey years and activity was lower during 2018 – 2019 surveys. With no avoidance the activity equates to predicted mortality of approximately one bird every 1.7 years, but with 95% avoidance one bird every 34.7 years for operational turbine envelope (**Technical Appendix A9.3**) and approximately one bird every 1.1 years, but with 95% avoidance one bird every 21.4 years for operational turbine envelope. Average collision risk as predicted by Band et al., (2007) models is higher for kestrels in the proposed Development envelope (10.9%) compared to the Operational Corkey Windfarm (9.6%). Only a proportion of the kestrel flights utilised in collision risk estimate in 2014-2015 were recorded inside the operational (80%) and proposed (80%) turbine 500 m buffers and a smaller proportion in 2018-2019 inside the operational (100%) and proposed (88%) turbine 500 m buffers. Thus, a further reduction in risk is likely of approximately 0 – 20% from the estimates provided in **Technical Appendix A9.3**.

165. A study by Musgrove et al., (2013) estimated that the UK population of kestrels were estimated at 46,000 pairs in the UK (1,000 for Northern Ireland). On the basis of the above any collision rates at the proposed Development would suggest that negligible proportion of kestrels may be affected from the UK population. No kestrels nested within 1 km of the proposed turbines and indeed the majority were recorded more than 2 km of the proposed turbines, therefore actual risks for this species of displacement and/or collision are considered low, but will continue to be monitored as part of the monitoring protocol outlined here (**Section 9.7; Technical Appendix A9.4**).

166. Kestrels are considered vulnerable to collision (Whitfield & Madders, 2006[42]) and collision risk modelling using the five-minute intervals to the nearest minute as duration which would over-estimate the amount of time spent in the windfarm area. Therefore, whilst further collision risk modelling has been undertaken it must be noted to be heavily caveated (see **Table 9.1**) and residual effects considered for in perpetuity operation of the Development which can be monitored via the monitoring programme (**Section 9.7; Technical Appendix A9.4**). Any associated collision risk estimate also does not take into account the spatial preferences and/or usage of the site which shows that activity is primarily away from the proposed area of the turbines (**Technical Appendix A9.1; Figure 9.15 & 9.34**).

167. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to kestrel from collision throughout the operational phase.

9.5.6.8 Raven

168. Information on raven flight trajectories and data is available here (**Technical Appendix A9.1; Figures 9.16 and 9.35**). It appears from mapping of flight-lines that avoidance and lower rates of usage around the existing turbines is evident (see **Figures 9.16 & 9.35**). It is noted that ravens were frequently detected during vantage point observations (164 sightings in 2014-2015 and 135 sightings in 2018-2019) and that observer's concurred that these were associated with movements to / from the vicinity of known territories within 2 km (at Corkey quarry, north side of Knockagallan south of Mallaboy and at Gruig) and a winter roost site located within the Slieveanorra Forest more than 2 km away. Raven are cited on the Slieveanorra and Croaghan ASSI designation.

169. The flights that did occur through the Site were across a range of altitudes both inside and outside the potential collision risk zone for existing and proposed turbines and also in some instances associated with carrion available in some parts of the Site and wider Survey Areas. This species was also frequently recorded perching on fence-posts, met masts and the control room during vantage point surveys (**Technical Appendix A9.1**) and the species seems readily habituated to the existing infrastructure there. Mitigation measures (**Section 9.7**) have recommended that any carrion is removed from the Site during the operational phase of the Development in order to minimise collision risk of this species (and buzzards) in particular and some gull species that were also observed being drawn into the core site for foraging.

170. Raven flights occurred both inside and outside the potential collision risk height (**Technical Appendix 9.3; Table 9.22 & 9.23**) within a range of height bands and were recorded between 32-59% within collision risk height for operational turbines and 41-79% at proposed turbines. Therefore c11-68% of flights were at no risk of collision. Since methods utilised here for CRM do not direct the use of timed flights, by using the five minute interval to the nearest minute it must be noted that this method would considerably over-estimate collisions and therefore whilst further collision risk modelling is undertaken (**Technical Appendix A9.3**) these provide only indicative indications and may be at least 5-fold over-estimated since recording was at five minute intervals.

171. The collision risk predicted in 2014-2015 at the Operational Corkey Windfarm envelope equates to up to 16.9 raven (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 2.1% (i.e. 16.9 divided by 800 – 2 x 400 pairs – raven) from the Northern Ireland adult population (Musgrove et al., 2013) or 0.1% of the UK population (7,400 pairs / 14,800 birds). With the recommended avoidance, for raven as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.3 raven (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 0.05 years, but with 95% avoidance one bird every 2.9 years (**Technical Appendix A9.3**).

172. The collision risk predicted in 2014-2015 at the proposed Development envelope equates to up to 28.3 (**Technical Appendix A9.3**) in the absence of avoidance. This represents approximately 3.5% (i.e. 28.3 divided by 800 – 2 x 400 pairs – raven) from the Northern Ireland adult population (Musgrove et al., 2013) or 0.2% of the UK population (7,400 pairs / 14,800 birds). With the recommended avoidance, for raven as 98% (Provan & Whitfield, 2006; SNH 2014; 2017) this declines to a negligible 0.5 raven (**Technical Appendix A9.3**). With no avoidance this equates to approximately one bird every 0.04 years, but with 98% avoidance one bird every 1.8 years (**Technical Appendix A9.3**).

173. There was some variation between survey years and activity was higher during 2018 – 2019 surveys. With no avoidance the activity equates to predicted mortality of approximately one bird every 0.1 years, but with 98% avoidance one bird every 6.7 years for existing turbines (**Technical Appendix A9.3**) and approximately one bird every 0.08 years, but with 98% avoidance one bird every 4.2 years for existing turbines. Average collision risk as predicted by Band et al., (2007) models is lower for ravens in the proposed Development (10.9%) compared to the existing Corkey Operational Windfarm (12.4%). Only a proportion of the raven flights utilised in collision risk estimate in 2014-2015 were recorded inside the operational (64%) and proposed (65%) turbine 500 m buffers and a smaller proportion in 2018-2019 inside the operational (66%) and proposed (70%) turbine 500 m buffers. Thus, a further reduction in risk is likely of approximately 30 - 36% from the estimates provided in **Technical Appendix A9.3**.

174. A study by Musgrove et al., (2013) estimated that the UK population of ravens at 7,400 pairs in the UK (400 for Northern Ireland). On the basis of the above any collision rates at the proposed Development would suggest that negligible proportion of ravens may be affected from the UK population. No ravens nested within 1 km of the proposed turbines and indeed the majority were recorded more 2 km of the proposed turbines, therefore actual risks for this species of displacement and/or collision are considered medium to low, but will continue to be monitored as part of the monitoring protocol outlined here (**Section 9.7; Technical Appendix A9.4**).

175. Any collision risk estimate does not take into account the spatial preferences and/or usage of the Site which shows that activity is primarily away from the proposed area of the turbines (**Figures 9.16 & 9.35**), and located around areas of identified breeding territories (**Technical Appendix A9.1**) and also it appears that this species is exhibiting avoidance of operational turbines (**Figure 9.16 & 9.35**) therefore collision rates are likely to be considerably lower than any predicted rate and over-estimated by the use of the five minute interval timings and inclusion of all flights in the indicative collision risk models (**Technical Appendix A9.3**).

176. There have been no collisions recorded of this species at the Operational Corkey Windfarm and in conclusion, as shown above, the Development presents no significant risk to kestrel from collision throughout the operational phase.

9.5.7 Potential Effects by Species

177. Through the extensive suite of surveys and field data aggregated for the proposed Development (**Technical Appendix A9.1**) desktop reviews (**Technical Appendix A9.2**) and collision risk modelling (**Technical Appendix A9.3**) there are a number of primary and secondary ornithological receptors identified. These include waders (snipe, curlew, golden plover) and red grouse; raptors (hen harrier, merlin, peregrine, buzzard, kestrel, and the allied corvid raven); waterbirds & wildfowl (whooper

[42] Whitfield, D. P. & Madders, M. (2006). A review of the impacts of wind farms on Hen Harriers *Circus cyaneus*. NRIN Natural Research Ltd.

swan and greylag goose) and small passerines (within the footprint of the proposed Development) and for which the potential effects are reviewed and summarised here.

9.5.7.1 Waders

178. For waders three primary ornithological receptors were identified during surveys: golden plover, curlew and snipe. Waders (Pearce-Higgins et al., 2009; 2012) may be sensitive to displacement to windfarm development, based on published information, ground-nesting breeding strategy and conservation status.

9.5.7.2 Golden plover

179. Golden plover are present during the migration season and during winter. This species presently utilises the Operational Corkey Windfarm for roosting and flights are also recorded. Golden plover are not recorded breeding in the area which is also confirmed by desktop studies (**Technical Appendix A9.1; A9.2**) therefore no breeding season displacement effects could occur (Sansom et al., 2016).

180. Research indicates a relative tolerance for disturbance and landscape changes for golden plover (Pearce-Higgins et al., 2007) including to windfarms (Fielding & Haworth, 2010). Douglas et al., (2011) found no evidence of changes in abundance or distribution of golden plover (and red grouse) and an increase of breeding golden plover from seven to 13 pairs within three years. Whilst (breeding) golden plover were considered to be displaced at 200 m by Pearce-Higgins et al., (2009) there was no long-term operational impacts shown elsewhere (Fielding & Haworth, 2013).

181. Golden plover were recorded migrating through the Survey Area. The majority of these all subsequently departed but small numbers continued to over-winter within the Operational Corkey Windfarm. Published information, notably Douglas et al., (2011) which found an increase in (breeding) golden plover at some windfarm sites, and analysis here suggests a neutral effect with low magnitude, potentially beneficial (Douglas et al., 2011) effect. The beneficial effect would only occur, if suitable breeding habitat exists and is retained nearby. Currently the Site itself is of marginal suitability for breeding golden plover, and therefore the proposed Development is considered more likely to have a negligible effect on golden plover.

182. Research on golden plover (breeding and wintering) indicates they appear to be tolerant of turbines (Fielding & Haworth, 2010; Douglas et al., 2011) and are recorded to routinely fly and breed within and through active windfarm locations. A negligible effect is therefore predicted for this species, although residual risk can be monitored to quantify actual mortality, if any (**Section 9.7**).

183. There are no significant effects predicted for golden plover since the species shows ready habituation to the existing turbines and tracks. Golden plover are classed as medium sensitivity by virtue of their occurrence on Annex 1 and as a red-listed species of conservation concern (**Table A9.1**). On the basis of observed habituation, wintering / migratory season presence only, and relatively low sensitivity to disturbance as indicated in the literature the potential effects on golden plover are classified as negligible change in the magnitude of effects to repowering at Corkey and hence they have been scoped out on the basis of no potential for significant effects in agreement with NIEA (**Table 9.1**).

9.5.7.3 Curlew

184. Whilst waders may be considered particularly vulnerable to displacement during decommissioning/construction activity including the curlew (and snipe) (Pearce-Higgins et al., 2009; 2012) the response of bird species is variable including curlew (Whitfield et al., 2010[43]; Thomas, 1999; P. Whitfield, personal communication) and golden plover (Fielding & Haworth, 2010; Douglas et al., 2011) and any negative effects appear to decline post-construction (Pearce-Higgins et al., 2012). Whitfield et al., (2010) in a long-term study found no evidence of a reduction in breeding success or immediate or gradual displacement of curlew. Individual curlew response varied between sites and there was no evidence of displacement even at 200 m and at some sites curlew actually moved closer to turbines during the post-construction period and routinely nested within 'tens of metres' from turbine bases.

185. It is recognised that curlew may be vulnerable to displacement by windfarms though the study by Pearce-Higgins et al., (2009) found evidence of displacement at the "large scale" (up to 800 m), it also found no significant evidence of displacement at the "fine scale" (up to 500 m). Thus, there is conflicting evidence whether curlew actually are displaced. Pearce-Higgins et al., (2012) re-enforces the likely potential impact on large waders (notably snipe and curlew), but indicates that other factors including whether displacement is considered a population "loss", long-term results and the effects mitigation and habitat management are not fully known.

186. The one territory that did occur within the 800 m survey area represents 0.19 of the regional population (average 526; range 252-783; Colhoun et al., 2015) although Musgrove et al., (2013) defines a higher regional population of circa 2,000 pairs (which equates to 0.5%) and 0.001% of the national population (circa 68,000 pairs; Musgrove et al., 2013).

187. Any likely effects are avoided given the set-back distances of turbines from the curlew (**Section 9.7**). Pearce-Higgins et al., (2012) effectively prescribes a 620 m – 800 m buffer around turbines for curlew and all curlew territories are beyond this greater distance (>1.1 km), therefore it is predicted these territories will be retained on the basis of this published information. Based on Pearce-Higgins et al., (2009) there is no predicted loss or displacement of curlew at Corkey since they do not occur within 500 m, nor 800 m nor 1 km zones outlined in that study.

188. Curlew are classified as high sensitivity on the basis of the national declines in Ireland (Colhoun et al., 2015[44]), its red-listed status nationally (Colhoun & Cummins, 2013) and published sensitivity to windfarm development (e.g. Pearce-Higgins et al., 2009; 2012). However the spatial set-back (>1 km) at Corkey from identified territories avoids risk of disturbance and displacement, and therefore there is negligible change in the magnitude. In fact there is a lower risk of collision as identified in the collision risk models for curlew when compared to the existing turbines (**Section 9.6.4.4; Technical Appendix 9.3**) and therefore the proposed Development is considered positive and as risk reduction for curlew locally, since the overall numbers of turbines are reduced (see also **Technical Appendix A2.1**).

189. Based on Pearce-Higgins et al., (2009) the proposed Development turbines are more than adequately set-back (>800 m) from identified curlew territories and therefore no curlew territories will be affected by the Development (**Technical Appendix A9.1; Section 9.6.4**). Therefore, no significant effects are predicted either from displacement nor collision since the predicted rate of collision is negligible.

9.5.7.4 Snipe

190. As above; waders, including snipe, may be vulnerable to displacement during windfarm development (Pearce-Higgins et al., 2009; 2012). Whilst it is recognised that the response of bird species is variable to windfarm development (Whitfield et al., 2010; Thomas, 1999; Fielding & Haworth, 2010; Douglas et al., 2011) and negative effects appears to decline post-construction (Pearce-Higgins et al., 2012) snipe, are considered the most potentially affected species at this location.

191. Snipe may be reduced in density within 500 m of turbines although the effects decline beyond 400 m (Pearce-Higgins et al., 2009). Breeding snipe may be sensitive to displacement to windfarm development, based on published information, ground-nesting breeding strategy and conservation status. Snipe are defined as low sensitivity (**Table 9.2**) since numbers recorded here (maximum of eight territories in the windfarm area) comprise <1% of the regional population (0.7% of 1,123 pairs; Colhoun et al., 2015) and considerably less than the UK estimate of 80,000 pairs (0.01%) and since the species is amber-listed regionally (Colhoun & Cummins, 2013) rather than red-listed.

192. The numbers of snipe territories recorded in the locality comprise approximately 0.3% - 0.7% of the regional population (1123 average; range 527-1782; Colhoun et al., 2015) although Musgrove et al., (2013) defines a higher regional population of circa 4,000 pairs (which equates to 0.1% - 0.2%) and 0.005% - 0.01% of the national population (circa 80,000 pairs; Musgrove et al., 2013).

193. With between four and eight snipe territories recorded within 500 m boundaries of the operational and/or proposed windfarms (**Section 9.6.1**) there is no difference in any survey years of the numbers recorded within the Operational Corkey Windfarm area or the area of the proposed Development (**Section 9.6.1**). Therefore, there is no nett difference between theoretical displacement predicted for the Operational Corkey Windfarm and the proposed Development and there is considerable evidence of habituation of snipe within the Operational Corkey Windfarm although abundance and spatial distribution of snipe varied between years (**Technical Appendix A9.1**).

194. In the absence of long-term monitoring or indeed initial ornithology surveys completed for the development phase of the Operational Corkey Windfarm, it is not possible to know the original baseline of the snipe population, nor the attenuation time

[43] Whitfield, D.P., Green, M. & Fielding, A.H. (2010). Are breeding Eurasian curlew displaced by wind energy developments? *Natural Research Projects Ltd, Banchory, Scotland.*

[44] Colhoun, K., Mawhinney, K. & Peach, W. (2015). Population estimates and changes in abundance of breeding waders in Northern Ireland up to 2013. Bird Study 62

before the species occurred / recolonised during the post-construction period. It is evident though that snipe are utilising the operational site, and would likely continue to do so. There were snipe located during winter walkover and wintering priority species searches within the 500 m turbine envelope, but these can readily displace to other nearby habitats.

195. The various displacement modelling carried out for snipe (**Section 9.6.1**; Pearce-Higgins et al., 2009), identifies that whilst theoretically displacement may occur for this species this could conceivably occur at exactly the same levels in relation to the Operational Corkey Windfarm and at the proposed Development. Therefore the magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore negligible since both are predicted at the same level of displacement. Furthermore the set-back distances, given the larger spacing between fewer, larger turbines is actually increased compared to the Operational Corkey Windfarm (**Section 9.6.1**) therefore a positive effect on displacement is predicted for the proposed Development.

196. However based on published literature of sensitivity during the phases associated with construction and decommissioning there is a low magnitude effect predicted for the decommissioning/construction phases for a temporary time period (i.e. until construction is completed) in the absence of mitigation via avoidance (**Section 9.7**). Despite the low sensitivity and therefore not significant effect predicted, and the observed low comparative risks to snipe displacement here, the Draft Habitat Management Plan, (**Technical Appendix A3.2**), proposes restoration of habitats. These are discussed in **Section 9.7** as the proposed habitat restoration and reinstatement will have positive implications for snipe which are known to occur, although numbers and distribution varies between years within 400-500 m of turbines and area already habituated within the windfarm area (**Figure 3.3**) and habitat management / restoration will optimise a rapid recovery post-construction for snipe.

9.5.7.5 Red grouse

197. There were several red grouse territories recorded here currently and historically (**Technical Appendix A9.1**), although habitat within the site is poor for nesting in some parts, in other areas excellent areas of deep heather occur in spatially explicit areas (**Figure 9.2**). A small number of red grouse territories occur around the site and within the Operational Corkey Windfarm footprint although the number and distribution of these changes between years. This species therefore shows considerable habituation in relation to the Operational Corkey Windfarm with territories occurring in close proximity to operational turbines and tracks (**Technical Appendix A9.1**).

198. Red grouse have been recorded to fledge a number of young in some years (maximum covey of seven birds recorded) thus birds appear reasonably productive at this site. Within the 500 m survey area between three and eight territories have been recorded with fewer in the 500 m zone of the operational turbines (three to seven) and fewer again in the proposed turbine 500 m buffer (three to six). Arguably then, fewer red grouse territories would be at risk since numbers of territories within the 500 m buffers of the repowered site are lower than the baseline (Operational Corkey Windfarm site).

199. Red grouse are not apparently affected by turbine development (Pearce-Higgins et al., 2009; Douglas et al., 2011) although construction can depress the population initially during construction (Pearce-Higgins et al., 2012). Published information suggests a neutral impact on this species, since both Pearce-Higgins et al., (2009) and Douglas et al., (2011) indicate no effects of windfarms on red grouse.

200. Thus red grouse are not considered to be significantly affected by windfarms (Pearce-Higgins et al., 2009; Douglas et al., 2011; Pearce-Higgins et al., 2012). In supporting information, Pearce-Higgins et al., (2012), found continued apparent negative impacts on waders, but re-iterated few impacts on red grouse and some species actually increased post-construction. Furthermore, all red grouse flights were recorded at <15m a.g.l during observations at Corkey (**Technical Appendix A9.1**) and thus vulnerability to collision is negligible.

201. As a regionally red-listed species (Colhoun & Cummins, 2013) red grouse are classified as medium sensitivity and on the basis of published information which shows negligible impacts and the lower spatial overlap with existing red grouse territories in the proposed Development, than the Operational Corkey Windfarm the magnitude of change between baseline (Operational Corkey Windfarm) and proposed windfarm is therefore negligible for red grouse in the repowering of Corkey, leading to a not significant effect.

9.5.7.6 Raptors

202. At Corkey and in the wider hinterland there are six breeding raptor species which have been documented, namely hen harrier, merlin, peregrine, buzzard, kestrel and sparrowhawk. The same species' assemblage was also recorded during the wintering seasons and hen harrier were recorded roosting in the wider area too. There were no breeding raptors or roosting raptors recorded within 500 m of the operational or proposed turbines (**Technical Appendix A9.1**). The risk of any direct displacement from breeding or wintering locations is therefore negligible since all species are located beyond published and/or recognised set-back / buffer distances (Currie & Elliot, 1997[45]; Ruddock & Whitfield et al., 2007; Whitfield et al., 2008).

9.5.7.7 Hen harrier

203. Hen harrier are defined as very high sensitivity at this locality since the species is listed as a site feature on the nearby Antrim Hills SPA; red-listed nationally (Eaton et al., 2015) and amber-listed regionally (Colhoun & Cummins 2013).As outlined above hen harriers may face the same generic risks to wind energy development that have been identified for other birds including behavioural avoidance; perturbation due to habitat modifications and mortality through collision. Hen harriers were recorded foraging only infrequently during the summer and the winter within the study area (**Technical Appendix A9.1**).

204. There is a relatively detailed quantity of research on hen harriers which are indicates the species is potentially sensitive to windfarm development (Percival, 2003; Pearce-Higgins et al., 2009) at up to 2 km (Bright et al., 2008; McGuiness et al., 2015) during both breeding and wintering seasons. The effects of windfarms have been considered a risk to hen harriers due to the spatial overlap with windfarms and wintering or breeding habitats (Haworth & Fielding, 2012[46]). They are considered to be at relatively low risk of collision and low-medium risk of displacement (Madders & Whitfield, 2006) with high (>99%) avoidance rates (Garvin et al., 2011; SNH, 2014; 2017) and will avoid wind turbines and considered to be less vulnerable to displacement. Madders & Whitfield (2006) reviewed several studies and found little evidence of large-scale displacement and ultimately suggested that foraging avoidance mostly extended to approximately 100 m although nest displacement was reported at 200 m to 300 m.

205. Despite the low-medium risks of collision mortality identified by Whitfield & Madders (2006), hen harrier collisions have been reported (Lekuona & Ursúa, 2005[47]) but there does not appear to be a link between abundance and collision in hen harriers (Whitfield & Madders, 2006) and mortality of harriers may also be disproportionately lower than other raptors (Drewitt & Langston, 2008). Hen harriers may also be at lower risk of collision due to the majority of low elevation flights undertaken by the species (Madders, 2000[48]; Whitfield & Madders, 2006; Band et al., 2007) which does not normally predispose them to flying within the rotor swept zone and high frequency of avoidance responses observed (Garvin et al., 2011). Wilson et al., (2015) suggested that collision risk may be affected by the proximity of the nest and during breeding displays, but that collision probability is generally low.

206. The key study examining displacement in hen harriers (Pearce-Higgins et al., 2009) found that avoidance extended to 250 m from turbines with reduced flight activity and that breeding density would be consequently be reduced by 52.5% (range -1.2% to 74.2%). This study also found that risk exposure of hen harriers was unrelated to flying height and that there was no significant reduction in abundance affected by windfarm tracks or transmission lines although avoidance rates may be site specific. Haworth & Fielding, (2012) found that avoidance of 100 m to 250 m seems to be the consensus on minimum estimated avoidance for nesting and foraging (see also Madden & Porter, 2007; 10 m to 100 m)

207. In Scotland nests have been recorded at one site, Cruach Mhor, between 131m and 476m (average = 284m) (SPR, 2009; Robson, 2011[49]) from turbines where there was an inclusive habitat enhancement area. Other nests have been recorded elsewhere in Scotland at 110 m away from turbines (Forrest et al., 2011[50]) with a similar density of nesting pairs recorded in pre and post construction (2.6 pairs pre-construction phase; 2.4 pairs operational phase; with 4.5 pairs construction phase). Both of these sites also recorded Hen Harriers nesting within a few hundred metres during construction phases. McMillan (2011)[51] reports nesting hen harriers at 500 m from turbines and less than 200 m from access tracks whilst O'Donoghue et al.,

[45] Currie, F. & Elliott, G. (1997). Forests and birds: a guide to managing forests for rare birds. Cambridge: Forestry Authority and RSPB
[46] Haworth, P. F. & Fielding, A. H. (2012). A review of the impacts of terrestrial wind farms on breeding and wintering hen harriers. Report prepared for Scottish Natural Heritage.
[47] Leukona, J.M & Ursúa, C. (2007). Avian mortality in wind power plants of Navarra (Northern Spain). In: de Lucas M, Janss GFE, Ferrer M (eds) Birds and wind farms: risk assessment and mitigation. Editorial Quercus, Madrid, pp 177–192
[48] Madders, M. (2000). Habitat selection and foraging success of Hen Harriers *Circus cyaneus* in west Scotland. *Bird Study* 47: 32-40.
[49] Robson, P. (2011). Hen Harrier activity at Cruach Mhor windfarm: Review of monitoring data 2001 – 2011. ScottishPower Renewables.
[50] Forrest, J., Robinson, C., Hommel, C. & Craib, J. (2011). Flight activity and breeding success of Hen Harrier at Paul's Hill wind farm in north east Scotland. Poster presented at 2011 Conference on Wind Energy and Wildlife Impacts, Trondheim, Norway.
[51] McMillan, R.L. (2014). Hen harriers on Skye, 2000–12: nest failures and predation. Scottish Birds 34: 30-39.

2011[52]; found an average displacement of 501m (range 140 m – 760 m). During wind farm construction, displacement has been suggested potentially to occur up to 500 m around construction sites with some disruption up to 1 km, depending on line of visibility (Madders 2004[53]; Bright et al. 2006[54]; Madden & Porter, 2007[55]).

208. These studies show that individual responses may be highly variable (see review in Wilson et al., 2015) and typically extend between 50 m and 1 km. Taking the findings of Pearce-Higgins et al., (2009) with an average behavioural avoidance of 53% within 500 m by inference would imply that there would be no observed avoidance at 950 m (i.e. circa 1 km). Several reviews and recommendations for set-back distances (Currie & Elliot, 1997; Petty, 1998[56]; Ruddock & Whitfield, 2007) in their reviews of hen harrier disturbance zones suggested buffers of 500 – 600 m; 500 – 1000 m and 500 – 750 m respectively and such metrics are frequently applied to windfarm developments (Obermeyer et al., 2011[57]).

209. Fernández-Bellon et al., (2015) examined proximity of turbines of breeding parameters of Irish hen harriers including metrics and found there were no statistically significant relationships found between breeding parameters (nest success; brood size; productivity) and distance of the nest from the nearest wind turbine. However, a near significant result was recorded with lower nest success within 1 km of wind turbines. This concurs with similar maximum direct disturbance or indirect displacement distances recorded in other studies (Ruddock & Whitfield 2007; Pearce-Higgins et al., 2009).

210. On the basis of published research which generally indicates a relatively low sensitivity to windfarms, low risk of collision and displacement effects and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**), no spatial overlap of both breeding (>2.5 km away) or wintering locations (>1.5 km away), and low collision risk estimates (**Technical Appendix A9.3**) in both the proposed Development and the Operational Corkey Windfarm the magnitude of change between baseline (Operational Corkey Windfarm) and proposed windfarm is therefore negligible and not significant effect for hen harrier in the context of the proposed Development. There is also a lower predicted risk of collision for the proposed Development than for the operational site (**Technical Appendix A9.3**) indicating a potentially positive effect for the species locally and regionally by repowering.

9.5.7.8 Merlin

211. Merlin are defined as very high sensitivity at this locality since the species is listed on Annex I of the Birds Directive and is listed as a site feature on the nearby Antrim Hills SPA, red-listed nationally (Eaton et al., 2015) and amber-listed regionally (Colhoun & Cummins 2013). As outlined above merlin may face the same generic risks to wind energy development that have been identified for other birds including behavioural avoidance; perturbation due to habitat modifications and mortality through collision. Merlin were recorded foraging only infrequently during the summer and the winter within the study area (**Technical Appendix A9.1**).

212. There is scant information available on effects of windfarms on merlin, although there are some records of turbine-mediated mortality (K. Duffy, personal communication; Hotker, 2006[58]). Ruddock & Whitfield (2007) in that review noted a relative tolerance for some disturbance in this species and relative habituation to human activity in parts of the range (in the US) where urban nesting is frequently recorded although they are considered to be relatively sensitive to disturbance during the laying and egg-incubation stages.

213. Only one pair of merlin occurs in the wider hinterland and is beyond the zone of influence at the windfarm which represents (3.1% of the regional population; 32 pairs; Ewing et al., 2011) and 0.09% of the UK population (1162 pairs; range 891-1462; Ewing et al., 2011; Musgrove et al., 2013). In Northern Ireland, the species is rarely recorded nesting on the ground, and more frequently recorded nesting in other species' nests (predominantly corvid) at the edge of forest plantations i.e. tree nesting and frequently along the edge of roads and paths. This is confirmed to be the case in Antrim Hills and nearby nests were located >2.5 km away (and mostly >4km) from the operational and/or proposed turbines. Whilst these have been recorded historically to nest closer (M. Ruddock personal observation) to the Operational Corkey Windfarm(s) in the area (circa 1-1.5 km away) they were not nesting at this proximity during the field surveys conducted here. A range of buffers have been identified for merlin in order to avoid disturbance in the order of 200 m to 400 m (Currie & Elliot, 1997) and 300 m to 500 m (Ruddock & Whitfield, 2007) and this species occurs considerably beyond that distance at Corkey therefore no disturbance or displacement is likely.

214. On the basis of published research which generally indicates a relatively low sensitivity to disturbance (<500 m) and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**), no spatial overlap of breeding locations (>2.5 km away), and low collision risk estimates (**Technical Appendix A9.3**) in both the proposed windfarm and the Operational Corkey Windfarm the magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore negligible for merlin. There is a higher predicted risk for collision in the proposed Development than for the operational site (**Technical Appendix A9.3**) indicating a potentially negative effect for the species locally and regionally by repowering however the mortality predictions are in the order of several hundred years (>745 years) and in one year of survey merlin were not recorded at risk of collision at all. Therefore a not significant effect is predicted for this species.

9.5.7.9 Peregrine

215. Peregrine are defined as medium sensitivity at this locality since the species is listed on Annex I of the Birds Directive although and are both regionally and nationally green-listed having recovered from previous historical declines (Colhoun & Cummins, 2013; Eaton et al., 2015). The nearest SPA for this species is at Rathlin Island off the Co. Antrim coast (>25 km to the north). As outlined above peregrines may face the same generic risks to wind energy development that have been identified for other birds including behavioural avoidance; perturbation due to habitat modifications and mortality through collision. Peregrine were recorded foraging only infrequently during the summer and the winter within the study area (**Technical Appendix A9.1**) and an identified territory is known nearby (>1.3 km) which has been occupied (intermittently) throughout the operational lifetime of the extant windfarm at Corkey since the 1990s.

216. Peregrines may be vulnerable to collision with turbines during the operation phase. With no avoidance a maximum of 0.08 – 0.46 peregrines might be killed annually during the operational and/or proposed Development on the basis of current data, with recommended avoidance rate this is reduced to a negligible number of peregrines (**Technical Appendix A9.3**) with one bird predicted to be killed between 108 and 579 years at either the operational or proposed turbines which varies between years. This equates to a negligible amount of both the peregrine regional population in Northern Ireland (83 pairs; Wilson et al., 2018) and nationally (1,769 pairs; Wilson et al., 2018).

217. Peregrines are known to nest in close proximity to turbines installed at quarry and moorland sites in Northern Ireland (ranging from 25m to 300 m) and no displacement is predicted. There is considered to be a relatively low rate of collision likelihood (Madders & Whitfield, 2006) although a small number of peregrine-turbine collisions are documented within Europe including the Orkney Islands, Scotland (Meek et al., 1993[59]; Ruddock & Reid, 2010; K. Duffy, personal communication). The ability for a population to tolerate extrinsic mortality factors is dependent on demographic parameters of the population being assessed; most notably productivity and survival rates (Ruddock et al., 2008; Whitfield et al., 2008; Fielding et al., 2009).

218. The peregrine population in Northern Ireland ranges between 40 and 92 pairs and has declined recently to around 80 pairs per annum fledging, on average, approximately 110 young per annum (Wells & Ruddock, 2008[60]). First year annual survival of juvenile peregrines is typically low (54.4%) and increases in adulthood (80%; Craig et al., 2004[61]) although population specific survival rates in Ireland are largely unknown; and the local population, in parts of the range is threatened by persecution (Ruddock et al., 2008; Wells & Ruddock, 2008). The first year survival rate of 54% means conceivably 59.8 young peregrines (54.4% of 110 average young per year) could be dead within the first year due to other causes.

219. Therefore, windfarm mediated causalities are comparatively low in relation to theoretical background or 'natural' mortality levels. However, extrinsic mortality factors can be additive and post-construction monitoring of peregrines would be informative, particularly if peregrines are successful breeding since young peregrines may be more prone to collision due to

[52] O'Donoghue, B., O'Donoghue, T. A. & King, F. (2011). The Hen Harrier in Ireland: conservation issues for the 21st Century. Biology & Environment: Proceedings of the Royal Irish Academy 111: 1-11.
[53] Madders, M. (2004). The ecology of hen harriers in Scotland in relation to windfarms. Report on Penbreck and Carmacoup proposed windfarm.
[54] Bright, J. A., Langston, R. H. W., J, E. R., Gardner, S., Pearce-Higgins, J. & Wilson, E. (2006). Bird sensitivity map to provide locational guidance for onshore wind farms. A report by the Royal Society for the Protection of Birds,
[55] Madden, B. & Porter, B. (2007). Do wind turbines displace Hen Harriers *Circus cyaneus* from foraging habitat? Preliminary results of a case study at the Derrybrien wind farm, County Galway. *Irish Birds* 8: 231-236.
[56] Petty, S.J. (1998). Ecology and conservation of raptors in forests. Forestry Commission Bulletin 118. HMSO, London.
[57] Obermeyer, B., Manes, R., Kiesecker, J., Fargione, J. & Sochi, K. (2011). Development by Design: Mitigating Wind Development's Impacts on Wildlife in Kansas. PLoS One 6: e2669.
[58] Hötker, H. (2006). The impact of repowering of wind farms on birds and bats
[59] Meek, E.R., Ribbands, J.B., Christer, W.G., Davy, P.R. & Higginson, I. (1993). The effect of aerogenerators on moorland bird populations in the Orkney Islands, Scotland. *Bird Study* 40: 140 – 143.
[60] Wells, J.H. & Ruddock, M. (2008). Population dynamics of the peregrine falcon (*Falco peregrinus*) in Northern Ireland. In *Peregrine Falcon Populations – status and perspectives in the 21st Century J. Sielicki & T. Mizera (editors).*
[61] Craig G.R., White G.C., Enderson J.H. (2004). Survival, recruitment, and rate of population change of the Peregrine Falcon population in Colorado. *Journal of Wildlife Management* 68: 1032-1038

inexperience in flight and/or avoidance (**Section 9.7**). Given the predicted value of mortality is of low proportional magnitude of the national population and to "natural" peregrine mortality, the overall impact of collisions is considered negligible on the peregrine population.

220. Estimate for actual avoidance can be variable (Chamberlain et al., 2007) although the operational turbines have a lower theoretical risk of collision than the proposed turbines (**Technical Appendix A9.3**) based on the proportion of flights within 500 m of the operational and/or proposed turbines and duration of time spent at risk height, this equates to mortality of only a negligible theoretical number of peregrines. Turbines at which mortality was recorded for peregrines (red kites and merlin) at Braes of Doune, Scotland were all independent of proximity to known nest sites (K. Duffy, personal communication). Therefore it is not possible to predict which, if any, of the turbines may be a source of mortality. Theoretical collision risk for this species is negligible (**Technical Appendix A9.3**).

221. The closest operational and/or or proposed turbine to the peregrine nest is approximately 1.3 km away. The peregrines have three regularly utilised nest locations in the site (M. Ruddock, personal observation) although more recently the main face was reduced on grounds of safety. Whilst this site is intermittently productive (M. Ruddock, personal observation) the site as heretofore been relatively disturbed since it is an operational industrial site and therefore may not be sensitive to disturbance, particularly during construction, and at low potential risk of displacement via the proposed Development. Peregrines are recorded to nest within 200-300 m of active wind turbines in Northern Ireland (M. Ruddock, personal observation) in similar upland habitats.

222. The buffer that is recommended for peregrines breeding during wind farm developments (typically multiple turbines in upland habitats) is 750 m (M. Madders, personal communication). A comprehensive review by Ruddock & Whitfield, (2007, see also Whitfield et al., 2008) found recommended buffers or disturbance distance observations ranging from 8m to 4,500 m in the peregrine falcon. This study solicited fieldworker opinion on perceived disturbance and reports a mean distance of 199m to 354m although opinions ranged from 10 m to 750 m.

223. The distance at which human disturbance occurs will vary on a site-specific basis and also seasonally. Whitfield et al., (2008) recommends a buffer of 500 – 750 m during the breeding season. The upper limits found by Ruddock & Whitfield (2007) may be over-protective in pairs that are already habituated to human-activity; such as at this location. The design of the proposed repowering at Corkey has avoided any risks to disturbance and/or displacement of peregrine falcons at the locality by more than 1 km of a set-back from turbines.

224. On the basis of published research and evidence of close occurrence which generally indicates a relatively low sensitivity to wind turbines, low risk of collision and displacement effects and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**). There is also no spatial overlap of both breeding (>1.3 km away) or wintering locations (>1.3 km away), which is greater than published set-back distances (500-750 m; Ruddock & Whitfield, 2007) and low collision risk estimates (**Technical Appendix A9.3**) in both the proposed windfarm and the Operational Corkey Windfarm.

225. The magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore negligible for peregrine. There is a higher predicted risk for collision in the proposed Development than for the operational site (**Technical Appendix A9.3**) indicating a potentially negative effect for the species locally and regionally, however the mortality predictions are in the order of several hundred years (108 to 579 years) and overall collision risk is low. Therefore a not significant effect is predicted for this species.

9.5.7.10 Buzzard

226. Buzzard are defined as low-negligible sensitivity at this locality since the species is green-listed both regionally and nationally (Colhoun & Cummins, 2013; Eaton et al., 2015) but exhibited high frequency of occurrence here and may be vulnerable to collision and/or displacement. As outlined above buzzards may face the same generic risks to wind energy development that have been identified for other birds including behavioural avoidance; perturbation due to habitat modifications and mortality through collision. Buzzards were recorded foraging regularly during the summer and the winter within the study area (**Technical Appendix A9.1**) and a number of identified territories are known nearby with closest pairs recorded at approximately 1.1 km.

227. There are few specific studies of common buzzard published although numerous studies are documented in the USA with allied species such as red-tailed hawks *Buteo jamaicensis* (Garvin et al., 2011) with buzzard species considered to exhibit relatively high high-risk flight behaviours more often than all other raptor species (see also Orloff & Flannery, 1992), but also showed signs of avoidance. Buzzard species have been found beneath turbines during mortality searches (Smallwood, Rugge & Morrison, 2008[62]; Garvin et al., 2011).

228. Buzzard may be at collision risk throughout the operational lifetime of the windfarm with medium-low magnitude effects and with most prevalent risk likely during the breeding season. Buzzards have been recorded colliding with turbines, but flight activity may be reduced by up to 57.8% since they avoid windfarms (Pearce-Higgins et al., 2009) and collision risk therefore may be reduced. During the displacement modelling and research by Pearce-Higgins et al; foraging activity by buzzards was considered to be reduced within windfarm (Pearce-Higgins et al., 2009) indicating avoidance of such facilities, which appears visually to be evident in the mapping of flight lines at the operational Corkey windfarm (**Figures 9.14 & 9.33**).

229. Based on Pearce-Higgins et al., (2009) there is a predicted average reduction of 41.4% of buzzard foraging activity and therefore the collision risk estimates (caveated previously) are further likely to be over-estimated since there is considerable evidence of avoidance in the published literature. The population of buzzards in the UK and Ireland has seen exponential growth particularly since the 1990s (Balmer et al., 2013) with a national population of 57,000 – 79,000 pairs (Musgrove et al., 2013) and regional population of circa 2,000 pairs (Musgrove et al., 2013; Rooney, 2013). There are up to two pairs recorded in the 500 m survey area representing 0.003 – 0.004% of the UK population (**Figures 9.20 – 9.25; 9.39**) but all breeding sites are located more than 1.1 km away operational / proposed turbines and therefore there are negligible risks of direct impacts on the species.

230. On the basis of published research and evidence of close occurrence which generally indicates a relatively low sensitivity to wind turbines, medium risk of collision and displacement effects and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**) and apparent avoidance behaviour of the Operational Corkey Windfarm. There is also no spatial overlap of breeding locations (>1.1 km away), which is greater than published set-back distances for similar species, red kite (300-600 m; Ruddock & Whitfield, 2007) and low collision risk estimates given the large population of this species (**Technical Appendix A9.3**) in both the proposed windfarm and the Operational Corkey Windfarm.

231. The magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore medium-low magnitude for buzzard i in regards to the collision risk estimates provided. There is a higher predicted risk for collision in the proposed Development than for the operational site (**Technical Appendix A9.3**) indicating a potentially negative effect for the species by repowering, however the mortality predictions are heavily caveated here and overall collision effects on the receptor baseline are medium to low as the worst case scenario presented here. Therefore a not significant effect is predicted for this species.

9.5.7.11 Kestrel

232. Kestrel are defined as low sensitivity at this locality since the species is amber-listed regionally and nationally (Colhoun & Cummins, 2013; Eaton et al., 2015). However this species may be more vulnerable to collision since research suggests they are frequently recorded as turbine casualties but do not appear to avoid windfarms (Madders & Whitfield, 2006; SNH, 2014; 2017). Kestrel may be at collision risk throughout the operational lifetime of the windfarm with medium-low magnitude for negative effects with most prevalent risk likely during the breeding season when activity was marginally higher (**Technical Appendix A9.1**).

233. The population of kestrels in the UK and Ireland has seen some declines over time (Balmer et al., 2013) with a national population of 46,000 pairs (Musgrove et al., 2013) and regional population of circa 1,000 pairs (Musgrove et al., 2013). There is a maximum of one pair recorded in the 500 m survey area with 1- pairs recorded in the wider 2 km survey area. These 1-2

[62] Smallwood, K.S., Rugge, L. & Morrison, M.L. (2009). Influence of behaviour on bird mortality in wind energy developments. *Journal of Wildlife Management* 73: 1082-1098.

pairs represent 0.002 – 0.004% of the UK population (**Figures 9.20 – 9.25; 9.39**) but all breeding sites are located more than 1 km away operational / proposed turbines and therefore there are negligible risks of direct impacts on the species.

234. On the basis of published research and evidence of close occurrence which generally indicates a relatively medium sensitivity to wind turbines, medium-low risk of collision and displacement effects and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**). There is also no spatial overlap of breeding locations (>1.1 km away), which is greater than published set-back distances for similar species, merlin (300-500 m; Ruddock & Whitfield, 2007) and medium-low collision risk estimates given the potential sensitivity of this species (**Technical Appendix A9.3**) in both the proposed Development and the Operational Corkey Windfarm.

235. The magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore medium-low magnitude for kestrel in the proposed Development in regards to the collision risk estimates provided and medium sensitivity to windfarms and vulnerability to collision. There is a higher predicted risk for collision in the proposed windfarm than for the operational site (**Technical Appendix A9.3**) indicating a potentially negative effect for the species by repowering however the mortality predictions are heavily caveated here and overall collision effects on the receptor baseline are medium to low as the worst case scenario presented here. Therefore a not significant effect is predicted for this species.

9.5.7.12 Sparrowhawk

236. Sparrowhawk are defined as low sensitivity at this locality since the species is amber-listed regionally (Colhoun & Cummins, 2013) and green-listed nationally (Eaton et al., 2015). There is little information available on the impacts of windfarms on this species, but generally given the low altitude flights (typically <10 m a.g.l) the likelihood of collision is negligible. At the Corkey site all nesting pairs identified were recorded at more than 1.1 km with existing turbines recorded in closer proximity (1.12 km) than proposed turbines (1.14km) so set-back distances are minimally increased by the proposed Development.

237. There were negligible observed or theoretical risks of displacement or collision at the Corkey site given the set-back distances recorded (>1 km) and the low level flights recorded, none of which were at collision risk height for either the operational or proposed turbines. The are no sparrowhawk pairs recorded within the 500 m survey area (**Technical Appendix A9.1**) and the maximum of three to four pairs that were recorded within 2 km comprise 0.009 – 0.01% of the 35,000 pairs nationally (Musgrove et al., 2013) and 0.15% - 0.2% of the 2,000 pairs regionally (Musgrove et al., 2013).

238. On the basis of relatively low frequency of low altitude flights, generally indicates a relatively negligible sensitivity to wind turbines, negligible risk of collision and displacement effects and the observed information at this locality which shows a relatively low level of flight occurrence (**Technical Appendix A9.1**). There is also no spatial overlap of breeding locations (>1 km away), which is greater than published set-back distances for the similar, albeit larger species, goshawk (300-500 m; Ruddock & Whitfield, 2007) and negligible collision risk estimates given the potential sensitivity of this species in both the proposed windfarm and the Operational Corkey Windfarm.

239. The magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore negligible magnitude for sparrowhawk in the proposed Development due to negligible vulnerability to collision, disturbance or displacement. Therefore a not significant effect is predicted for this species.

9.5.7.13 Raven

240. Whilst not a raptor, NIEA had requested further information on raven, which are defined as low-negligible sensitivity at this locality since the species is green-listed regionally and nationally (Colhoun & Cummins, 2013; Eaton et al., 2015) and based on observational data there appears to be a high level of activity but also avoidance behaviour observed to the operational Corkey windfarm (**Figures 9.16 & 9.35**). Collision risk estimates, whilst heavily caveated indicate that a collision risk may occur, but the evidence of avoidance further reduces any likelihood of risk at this locality. However a number of measures are suggested to reduce the occurrence of this species locally (**Section 9.7**) and further minimise risks.

241. The population of ravens in the UK and Ireland has seen some increases over time (Balmer et al., 2013) with a national population of 7,400 pairs (Musgrove et al., 2013) and regional population of circa 400 pairs (Musgrove et al., 2013). There is a maximum of two pairs recorded in the 500 m survey area with up to two more pairs recorded in the wider 2 km survey area. These two pairs represent 0.03% of the UK population (**Figures 9.20 – 9.25; 9.39**) and 0.5% of the regional population but all breeding sites are located more than 1 km away operational / proposed turbines and therefore there are negligible risks of direct impacts on the species.

242. Site specific evidence of close occurrence to operational turbines and apparent avoidance which generally indicates a relatively low sensitivity to wind turbines, with a medium-low risk of collision and displacement effects. The observed information at this locality shows wide spread flight occurrence (**Technical Appendix A9.1**) and apparent avoidance behaviour of the Operational Corkey Windfarm. There is no spatial overlap of breeding locations (>1 km away) but there is a medium-low collision risk estimates given the large population of this species (**Technical Appendix A9.3**) in both the proposed Development and the Operational Corkey Windfarm.

243. The magnitude of change between baseline (Operational Corkey Windfarm) and proposed Development is therefore medium-low magnitude for raven in regards to the collision risk estimates provided. There is a higher predicted risk for collision in the proposed Development than for the operational site (**Technical Appendix A9.3**) indicating a potentially negative effect for the species by repowering however the mortality predictions are heavily caveated here and overall collision effects on the receptor baseline are medium to low as the worst case scenario presented here. Therefore a not significant effect is predicted for this species.

9.5.7.14 Swans & Geese

244. There is no predicted risk to swans, or their nests and/or collision on the basis of current field data. Some key ornithological receptor species of waterfowl/wildfowl were detected during surveys whooper swan but also mute swan and greylag geese) during surveys (**Technical Appendix A9.1**) although a range of other smaller waterfowl were recorded alongside the swans and geese. At the nearby Altnahinch Dam used mostly cormorants and some gulls and occasionally wildfowl but no swans or geese were recorded there. The key location for over-wintering swans and geese was to the north at Lissanoure.

245. The turbines are located more than 2 km from the nearest edge of the lake, utilised by swans and geese, which is greater than the published avoidance distances for swans and other wildfowl (Winkelman, 1985[63]; Langston & Pullan, 2003; Fijn et al., 2012[64]). Whilst there may be a risk of both collision and displacement of whooper swan at operational turbines (Rees, 2012) collision risk may be increased in poor visibility and at smaller turbines (Larsen & Clausen, 2002) and displacement at foraging sites may only extend to avoidance of 200 m – 400 m (Fijn et al., 2012) and one review suggests a maximum of 500 m – 600 m (Langston & Pullan, 2003).

246. In a detailed study of turbine avoidance by wintering pink-footed geese Larsen & Madsen (2000) suggest that 100-200 m was the avoidance distance for foraging geese and that over time they habituated (40-100 m) to the turbine presence (Madsen & Boertmann, 2008). The tolerance of turbines by Bewick's swans was also recorded to be a function of food supply and availability of supplementary food (beets; Fijn et al., 2012) and that they actually moved closer to turbines later in the wintering periods.

247. Fijn et al., (2012) found that foraging Bewick's swans occurred on average 560 m from turbines (nine turbine windfarm with rotor swept height of 40 m - 140 m) but were recorded as close as 125m. Since the nearest edge of the lake regularly utilised by whooper swans and greylag (and other waterfowl), is currently >2 km from all turbines and where swans and geese were detected (**Figures 9.20 – 9.26; 9.39**) therefore on the basis of majority of published tolerance information which ranges between 125m and 600 m will result in negligible risk of displacement.

248. Swans and geese, and particularly whooper swans are rarely reported as turbine collision victims (Fijn et al., 2012; Rees, 2012) and more often are recorded to collide with power-lines (Rees, 2006; M. Ruddock, personal observation). It is likely that turbines will be avoided by all swans (see also Fijn et al., 2012) and most regularly swans are known to fly relatively low <10 m a.g.l. (M. Ruddock, personal observation). These data are confirmed by GPS satellite flight data which recorded flights at an average of 9m a.g.l. over terrestrial habitats and 31m a.g.l over aquatic habitats (Griffin et al., 2011).

249. The documented terrestrial flying heights are below the rotor swept height of the proposed turbines and migrating flights as detected during surveys were actually above rotor height and there were no swan or goose migration or foraging / commuting

[63] Winkelman, J.E. (1985). Impact of medium-sized wind turbines on birds - a survey on flight behaviour, victims and disturbance. *Netherlands Journal of Agricultural Science* 33: 75-78.

[64] Fijn, R.C., Krijgsveld, K.L., Tijsen, W., Prinsen, H.A.M. & Dirksen, S. (2012). Habitat use, disturbance and collision risks for Bewick's Swans *Cygnus columbianus bewickii* wintering near a wind farm in the Netherlands. Wildfowl. 62: 97-116.

fly-ways identified during surveys with only a single detected flight recorded >150 m a.g.l.; more than 500 m away from the operational and/or proposed turbines.

250. Furthermore, any movements detected to / from roosting lakes at Lissanoure departed in a northerly direction and arrived from a northerly direction and thus no movements are in the direction of the Corkey windfarm. A small number of whooper swans and greylag geese were recorded that also could be at theoretical risk of mortality if they passed through the proposed windfarm although the flights recorded here were considerable distances from proposed turbines and/or above/below rotor height.

251. It is concluded that there is no significant risk of displacement at the proposed Development since swans, if they occurred are considerably more than >560 m away (see Langston & Pullan, 2003) from the turbine and literature confirms that displacement is usually only temporary in wildfowl (Larsen & Madsen, 2000; Madsen & Boertmann, 2008; Fijn et al., 2012; see also Pearce-Higgins et al., 2012).

252. Furthermore, it is concluded that there is negligible risk of collision from both the proposed turbines based on observed flying heights and flying trajectories and on the basis of published information larger turbines can actually reduce collision risk (Larsen & Clausen, 2002) when compared to smaller turbines which is the effective results of the proposed Development and also those smaller turbines which occur in the wider vicinity (**Technical Appendix A2.1**). Overall then no significant impacts are predicted for the proposed turbines and appropriate set-backs are retained to any swans both historically and currently.

253. Whooper swans are classified as medium sensitivity species since they are on Annex I of the Birds Directive and are red-listed regionally and nationally (Colhoun & Cummins, 2013). On the basis of the set-back distances (>2 km) and low incidence of occurrence during vantage point observations and no evidence of significant impacts in the literature whooper swan (nor for other swans or geese) there is a negligible risk of displacement, disturbance or collision, and therefore there is negligible change in the magnitude of any construction / decommissioning or operational effects due to the proposed Development. Therefore a not significant effect is predicted for this species.

9.5.7.15 Small passerines

254. Footprint analysis of breeding season data identified a small number of breeding territories within the 25m turbine and track buffer, which varied spatially between years (**Sections 9.6.1; 9.6.2**). These small number of territories may be disturbed or displaced but research also indicates that some species e.g. skylark and stonechat may actually increase during construction (Pearce-Higgins et al., 2012).

255. Footprint analysis of wintering data identified only a small number of species and locations 25m turbine and track buffer, which varied spatially between years all of which can move away to other adjacent habitats. Similarly snipe, and other species recorded here during the winter can readily displace to other adjacent habitats. Whilst 1-2 territories of some species were recorded in the footprint of the development the two predominant species in the footprint were meadow pipit and skylarks

256. Based on Pearce-Higgins et al., (2009) there is a predicted average loss of a small number of meadow pipit territories, although there were similar predictions for both the operational and proposed turbines (with only 6-7 territories difference between years) and thus the magnitude of change between baseline and the proposed Development is low magnitude since this represents less than 5% (**Table 9.3**) of local populations of birds in the area e.g. 266 - 371 meadow pipit territories which is 1.6 – 4.5% of the total number of territories recorded in the wider 500 m survey areas (**Section 9.6.1**) and no high or very high sensitivity species are likely to be affected during proposed Development phases. Skylark are not considered to be significantly affected by displacement (Pearce-Higgins et al., 2009; 2012) but may be vulnerable to disturbance and the difference between existing and operational footprints is between zero and five territories which represents 0-2.8% of the 134-174 territories recorded in the wider 500 m survey areas (**Section 9.6.1**)

257. Whilst there are a number of medium sensitivity (red-listed), low sensitivity (amber-listed) and negligible sensitivity (green-listed) species in the wider survey area and footprint area none of these occur in internationally, nationally, regionally significant population thresholds and there are only small differences in the footprint analysis between operational and proposed windfarms (**Section 9.6.1**). Therefore a low magnitude, negative effect which equates to worst case scenario as minor, and therefore not significant which is predicted in the absence of mitigation during construction / decommissioning which is reduced to negligible, and not significant effect on the displacement from the snipe, red grouse (and these small passerine) breeding locations provided adequate construction disturbance reduction measures are put in place (**Section 9.7**).

Table 9.8: Summary of Sensitivity, Extent, Magnitude, Duration and Significance of Effects

Receptor	Sensitivity	Potential Effect	Extent of Effect	Magnitude of Effect	Duration of Effect	Significance of Effect
Decommissioning / Construction Phase						
Hen harrier	Very High	Disturbance Displacement	Regional Regional	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Minor Minor
Merlin	Very High	Disturbance Displacement	Regional Regional	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Minor Minor
Peregrine	Medium	Disturbance Displacement	Regional Regional	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Buzzard	Low – Negligible	Disturbance Displacement	Local Local	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Kestrel	Low	Disturbance Displacement	Local Local	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Sparrowhawk	Low	Disturbance Displacement	Local Local	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Raven	Low – Negligible	Disturbance Displacement	Local Local	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Golden plover	Medium	Disturbance Displacement	Local Local	Negligible (evidence of habituation) Negligible (evidence of habituation)	Short-term Short-term	Negligible Negligible
Curlew	High	Disturbance Displacement	Local Local	Negligible (>800m) Negligible (>800m)	Short-term Short-term	Minor Minor
Snipe	Low	Disturbance Displacement	Local Local	Medium (<400m; evidence of sensitivity in literature) Medium (<400m; evidence of sensitivity in literature)	Short-term Short-term	Minor Minor
Red grouse	Medium	Disturbance Displacement	Local Local	Low - Negligible (<500m; CMP) Low - Negligible (<500m; CMP)	Short-term Short-term	Minor - Negligible Minor - Negligible
Whooper swan	Medium	Disturbance Displacement	Regional Regional	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible
Greylag goose	Low	Disturbance Displacement	Local Local	Negligible (>500m) Negligible (>500m)	Short-term Short-term	Negligible Negligible

Receptor	Sensitivity	Potential Effect	Extent of Effect	Magnitude of Effect	Duration of Effect	Significance of Effect
Meadow pipit	Medium	Disturbance	Local	Low - Negligible (small numbers may be disturbed)	Short-term	Minor - Negligible
		Displacement	Local	Low – Negligible (small numbers may be displaced)	Short-term	Minor - Negligible
Skylark	Medium	Disturbance	Local	Low – Negligible (small numbers may be disturbed)	Short-term	Minor - Negligible
		Displacement	Local	Low (small numbers may be displaced)	Short-term	Minor - Negligible
Small passerines	Medium / Low / Negligible	Disturbance	Local	Low - Negligible (small numbers may be disturbed)	Short-term	Minor - Negligible
		Displacement	Local	Low - Negligible (small numbers may be displaced)	Short-term	Minor - Negligible
Operational Phase						
Hen harrier	Very High	Displacement	Regional	Negligible (>500m; low frequency of occurrence;1ha difference of displacement)	Permanent but reversible	Minor
		Collision	Regional	Negligible (>500m)	Permanent but reversible	Minor
Merlin	Very High	Displacement	Regional	Negligible (>500m; low frequency of occurrence)	Permanent but reversible	Minor
		Collision	Regional	Negligible (>500m)	Permanent but reversible	Minor
Peregrine	Medium	Displacement	Regional	Negligible (>500m)	Permanent but reversible	Negligible
		Collision	Regional	Negligible (>500m)	Permanent but reversible	Negligible
Buzzard	Low – Negligible	Displacement	Local	Medium - Low (>500m)	Permanent but reversible	Minor - Negligible
		Collision	Local	Medium - Low (>500m)	Permanent but reversible	Minor - Negligible
Kestrel	Low	Displacement	Local	Negligible (>500m)	Permanent but reversible	Negligible
		Collision	Local	Medium – Low (>500m)	Permanent but reversible	Minor - Negligible
Sparrowhawk	Low	Displacement	Local	Negligible (>500m)	Permanent but reversible	Negligible
		Collision	Local	Negligible (>500m)	Permanent but reversible	Negligible
Raven	Low – Negligible	Displacement	Local	Negligible (>500m)	Permanent but reversible	Negligible
		Collision	Local	Medium - Low (>500m)	Permanent but reversible	Minor
Golden plover	Medium	Displacement	Local	Negligible (evidence of habituation)	Permanent but reversible	Negligible
		Collision	Local	Negligible (evidence of habituation)	Permanent but reversible	Negligible
Curlew	High	Displacement	Local	Negligible (>800m)	Permanent but reversible	Minor
		Collision	Local	Negligible (>800m)	Permanent but reversible	Minor
Snipe	Low	Displacement	Local	Medium - Low (evidence of habituation on site; no difference in displacement predictions between operational and proposed windfarm)	Permanent but reversible	Minor - Negligible
		Collision	Local	Negligible (low altitude flights)	Permanent but reversible	Negligible
Red grouse	Medium	Displacement	Local	Negligible (evidence of habituation on site; fewer in proposed500m buffer than operational 500m buffer; no evidence of sensitivity to windfarms	Permanent but reversible	Negligible
		Collision	Local	Negligible (low altitude flights)	Permanent but reversible	Negligible
Whooper swan	Medium	Displacement	Regional	Negligible (>2km)	Permanent but reversible	Negligible
		Collision	Regional	Negligible (>2km; no flight routes)	Permanent but reversible	Negligible
Greylag goose	Low	Displacement	Local	Negligible (>2km)	Permanent but reversible	Negligible
		Collision	Local	Negligible (>2km; no flight routes)	Permanent but reversible	Negligible
Meadow pipit	Medium	Displacement	Local	Low - Negligible (small numbers may be displaced)	Permanent but reversible	Minor - Negligible
		Collision	Local	Negligible (no evidence of collision risk)	Permanent but reversible	Negligible

Receptor	Sensitivity	Potential Effect	Extent of Effect	Magnitude of Effect	Duration of Effect	Significance of Effect
Skylark	Medium	Displacement	Local	Low - Negligible (small numbers may be displaced; no evidence of sensitivity to windfarms)	Permanent but reversible	Minor - Negligible
		Collision	Local	Negligible (no evidence of collision risk)	Permanent but reversible	Negligible
Small passerines	Medium / Low / Negligible	Displacement	Local	Low – Negligible (small numbers may be displaced)	Permanent but reversible	Minor - Negligible
		Collision	Local	Negligible (no evidence of collision risk)	Permanent but reversible	Negligible

9.5.8 Potential effects on designated sites / site features (Antrim Hills SPA)

258. The Antrim Hills SPA is located approximately 1 km (1,010 m) away from the nearest operational turbines and 1 km (1,027m) away from the nearest proposed turbines. The nearest Gruig turbine is located 844m away. The SPA was original designated in 2006; after the construction of the Corkey windfarm (1994) and is designated for hen harrier and merlin. The boundary rationale for the SPA was a 2 km buffer of historically known hen harrier and merlin territories (NIEA, personal communication). The site was designated on the basis of 25 pairs of hen harrier and eight pairs of merlin. Hen harriers have since declined considerably (Wootton et al., 2018) within the SPA to nine pairs (in 2016).

259. There is little information available for merlin and the effects of windfarms. Merlin home range may be in the order of 6-7km^2 (Sodhi & Oliphant, 1992) and connectivity to SPA should be considered at up to 5 km (SNH, 2016). Published literature (Becker, 1984; Currie & Elliot, 1997; Ruddock & Whitfield, 2007) confirms that disturbance effects on merlin are unlikely beyond 200-500 m. The findings here indicate a negligible risk of displacement, based on >2.5 km set-back distance and the negligible risk of collision (**Technical Appendix A9.3**).

260. Sensitivity of hen harriers to windfarms may occur up to 2 km (Bright et al., 2008; McGuinness et al., 2015). There are potential pathways from the Antrim Hills SPA to the Corkey windfarm since the Operational Corkey Windfarm and proposed repowering are within foraging range of the hen harrier (2-10 km; Arroyo et al., 2009; Irwin et al., 2012[65]) and within range for considering SPA connectivity (SNH, 2016). Foraging behaviour of breeding pairs can be influenced by habitat changes at distances up to 2-3 km from the nest (Amar et al., 2004, Arroyo et al., 2009). Foraging hen harrier were recorded during the field surveys conducted here (**Technical Appendix A9.1**). Hen harriers from the Antrim Hills SPA are therefore within foraging range of the operational and/or proposed Development and similarly hen harriers nesting in close proximity to the proposed Development are known to forage within the Antrim Hills SPA boundary.

261. Previous research has indicated that avoidance of wind farms by breeding hen harriers may occur within 1 km of turbines (Pearce-Higgins et al., 2009) and that breeding parameters may be affected by wind turbines up to 1 km (Fernandez-Bellon et al., 2015). Fernandez-Bellon et al. (2015)[66] found that there were no effects of turbine proximity on hen harrier breeding parameters (fledged brood size and productivity) but that there may be a negative effect on nest success extending approximately 1 km (see also Wilson et al., 2015; 2016). Productivity may also be reduced as shown by O'Donoghue et al. (2011) at a single hen harrier territory when comparisons are made between pre and post-construction periods (average of 2.63 young reduced to 1.27 young) over a 22 year period.

262. Nesting avoidance may only extend to 200 m – 300 m from wind turbines (Madders & Whitfield 2006; Robson, 2009; Forrest, 2011). The proposed turbines cannot therefore cause displacement of hen harriers from these identified nesting sites. Disturbance and/or displacement may occur at a range of distances 500-1000 m (Madders, 2004; Bright et al., 2006; 2008). Reviews of the direct disturbance of hen harriers have identified buffers of 500-600 m; 500-1000 m and 500-750 m (Currie & Elliot, 1997; Petty, 1998; Ruddock & Whitfield, 2007; Whitfield et al., 2008) to minimise disturbance. Hen harrier nest sites are not presently known to occur within the 500 – 750 m of any of the operational or proposed turbines which is the recommended avoidance distance for this species (Ruddock & Whitfield, 2007). All turbines are located more than 2.5 km from identified hen harrier territories in field surveys (**Technical Appendix A9.1**).

263. Displacement may occur where birds avoid areas around windfarms due to both infrastructure and loss of habitat. There remains a risk of displacement of foraging area for hen harriers (Pearce-Higgins et al., 2009) and for collision during the operational lifetime of the windfarm since they are known to occur in the area. There is currently negligible risk of displacement of breeding locations during all phases of construction or operation of either of these species and on the basis of current data; there is negligible risk of collision for hen harrier and merlin at the proposed development. Whether collision, if any, will occur in the future is difficult to predict, since these species have been recorded as turbine casualties in other studies (Ruddock & Reid, 2010). These two species are also known to nest in close proximity to active windfarms (M. Ruddock, personal observation).

264. Pearce-Higgins et al., (2009) indicated an average 53% avoidance at 500 m additional temporal avoidance of habitats are likely to occur during foraging. Pearce-Higgins et al., (2009) also suggested avoidance may be up to 78% of the foraging time utilised by hen harriers. The wind farm may therefore remove a portion of existing and potential foraging and nesting habitat for the hen harrier although the baseline usage and occurrence of foraging hen harriers is relatively low at Corkey (**Technical Appendix 9.1**). Foraging avoidance is likely to extend from a minimum of 100 m from wind turbines, extending to 250 m (Pearce-Higgins et al. 2009; Haworth & Fielding 2012).

265. Pearce-Higgins et al. (2009) indicates that hen harriers will totally avoid an area of approximately 250 m around wind turbines. Taking a (minimal) modelled spatial displacement/avoidance effect distance of 250 m from wind turbines (as described in Pearce-Higgins et al., 2009) results in a potential loss of habitat which may be available for nesting or foraging, of up to 95ha around the operational wind turbines and up to 96ha around the proposed wind turbines although some of the habitat here is already heavily damaged due to drainage and turf extraction.

266. Within 500 m zone then Pearce-Higgins et al., (2009) indicates up to 52.5% displacement of foraging activity; results in a potential displacement zone foraging, of up to 230ha (52.5% of which is 120.8) around the operational wind turbines and up to 261ha (52.5% of which is 137.5) around the proposed wind turbines which is a difference of 16.7ha over which hen harrier foraging activity may be reduced thereby further reducing collision risk between the operational (baseline) and proposed Development. There are 9.4ha proposed for habitat remediation and restoration as part of the habitat management plan which will benefit bird species, including prey species for the hen harrier.

267. The displacement modelling for total avoidance here therefore indicates that there is only 1ha of a larger potential zone of influence on hen harriers in the proposed Development compared to the Operational Corkey Windfarm (baseline). This difference is negligible much of the habitat in the site is poor condition and up to 9.4 ha is proposed for restoration and management. The compensation proposed for priority habitats via the Draft Habitat Management Plan (**Technical Appendix A3.2**) is therefore 8.4ha greater than the difference in potential habitat displacement for hen harriers and this habitat will be optimised (restored) such that it will be higher quality for foraging hen harrier should they occur during the operation of the proposed Development.

268. The data collected here indicates a small number of annual flight activity and transits through the proposed Development within 500 m of hen harriers and merlin. Since flights of both were at negligible risk of collision (**Technical Appendix A9.3**) and both hen harrier and merlin are present breeding in the wider area a negligible magnitude effect is predicted based on published research and site specific metrics including adequate set-back distances to nearby nest and/or roost sites (**Technical Appendix A9.1**).

269. The proximity of the proposed turbines are further than all of the research findings and distances for avoidance of disturbance / displacement effects for both hen harrier and merlin and there are negligible predicted impacts of disturbance / displacement or collision. Therefore no significant effects are predicted on the Antrim Hills SPA.

[65] Irwin, S., Wilson, M. W., O'Donoghue, B., O'Mahony, B., Kelly, T. C. & O'Halloran, J. (2012). Optimum scenarios for Hen Harrier conservation in Ireland. Report to the Dept. of Agriculture, Food & the Marine. 47pp.

[66] Fernández-Bellon, D., Irwin, S., Wilson, M. & O'Halloran, J. (2015). Reproductive output of Hen Harriers *Circus cyaneus* in relation to wind turbine proximity. *Irish Birds*. 10: 143-150.

9.6 Mitigation and Residual Effects

270. There are no major or moderate, i.e. no significant, effects predicted on ornithological features as a result of the Development, and therefore no mitigation is required, under the terms of the EIA Directive, however measures are proposed to further minimise any minor effects.

271. There are two primary ornithological receptors considered to be very high sensitivity (hen harrier and merlin). There are negligible effects predicted for disturbance, displacement or collision, for either of these two species. These two species are designated site features for the nearby Antrim Hills SPA and therefore minor to negligible and therefore not significant effects are predicted for the designated site, or site features. No mitigation is therefore required and avoidance measures have been embedded in the Development.

272. There are negligible collision risks for primary ornithological receptors including hen harrier, merlin, peregrine, and curlew. There are negligible disturbance risks for primary ornithological receptors including hen harrier, merlin, peregrine and curlew. There are low to negligible disturbance and displacement risks to red grouse and snipe, primarily due to the effects of decommissioning and construction activity; since there are fewer red grouse in the proposed turbine area when compared to the operational turbine area (baseline), and set-back distances are actually increased. No mitigation is therefore required and avoidance measures have been embedded in the Development.

273. There are minor to negligible collision risks for secondary ornithological receptors including buzzard, kestrel and raven, although the collision risk models are caveated and it has been recommended to monitor the rate of collisions (of all species) in the post-construction monitoring protocol (**Technical Appendix A9.4**) and any mortalities of these species would therefore be reported (see **Section 9.7**). No mitigation is therefore required and avoidance measures have been embedded in the Development.

274. The closest turbines to the priority target breeding and wintering species identified here are predominantly beyond 1 km to 2 km and therefore few species are at direct risk of disturbance although species may be sensitive to disturbance particularly during decommissioning/construction activity, and potentially displaced. Since the turbines are placed 1 km to 2 km away from most species (including hen harrier, merlin, peregrine, curlew, buzzard, sparrowhawk, kestrel, raven, whooper swans, greylag geese) and it is necessary that the existing set-back distances should be retained and guidance provided to contractors, to minimise risk to species and that breeding season restrictions on construction are put in place (Section 9.7).

275. There are some minor effects for (breeding) small passerines, red grouse and snipe within the footprint of the Development during the decommissioning/construction phases. Following the implementation of the Construction Management Strategy these effects are assessed to be short-term (construction / decommissioning phases) and negligible and therefore not significant.

276. Habitat management is proposed for the restoration and reinstatement of priority habitats (**Chapter 8; Technical Appendix A3.2**). Whilst no specific ornithological species require habitat mitigation measures due to no significant effects having been assessed, the HMP which proposes to manage 9.4ha will (i) off-set the negligible (1ha) of difference between habitat displacement calculations for hen harrier in the proposed windfarm areas (ii) encourage the rapid recovery of snipe post-construction activity and (iii) provide improved habitat conditions for meadow pipit, skylark (and other small passerines) across the site and off-set the small numbers of these passerines that may be displaced.

277. The proposed habitat management, thus offers further biodiversity (bird) benefits these will increase the suitability of the site for snipe in particular for breeding and foraging by the reversal of historical drainage and past peat cutting and extraction and management of grazing activities within these areas.

278. Complementary to the details proposed in the Draft HMP (**Technical Appendix A3.2**) it is recommended that additional factors are managed within the Site to maximise bird (breeding) populations and further minimise identified risks in the windfarm namely:

- Removal of carrion (including livestock) , if necessary, to reduce raven, gull and buzzard potential attractants to the windfarm (**Technical Appendix A3.2**)
- Raven and buzzard and kestrel perch management including removal of the existing lattice structure met mast on Operational Corkey Windfarm used for perching ravens;
- Cessation of turf extraction activities within the areas proposed for habitat management and in particular avoid the laying of turf or movement of machinery over potential nesting habitats during the bird breeding season (**Technical Appendix A3.2**);
  Management of grazing activities, as required to facilitate the restoration of priority habitats as part of the HMP which will benefit the restoration / reinstatement of habitats will be beneficial for biodiversity (**Technical Appendix A3.2)**;
- Avoidance of disturbance across open habitats by site visitors, agricultural users, windfarm maintenance staff / contractors, operational staff / contractors, wherever possible, via the production of a leaflet applicable for all site user groups explaining the risks of wildlife or habitat disturbance away from pathways including a map which shows clear demarcation of accessible / inaccessible areas. This will be incorporated with the health and safety and visitor information for the windfarm.

279. During the decommissioning/construction phases, and the activities proposed (see **Chapter 3**) prior to commencement of decommissioning/construction, Welstead et al. (2013)[67] recommends surveys to establish risk (which have been undertaken at Corkey; **Technical Appendix A9.1**) and careful construction management, including the appointment of ecological clerk of works (ECOW; see **Technical Appendix A3.1**).

280. Since there are some suitable bird breeding habitats near the proposed areas of decommissioning/construction works it is recommended that some mitigation measures are adopted to minimise risks to birds. That is, some temporal and spatial restriction on activities will be implemented in particular during any site clearance or enabling works. It is also recommended that some generic mitigation measures are simultaneously implemented during these phases.

281. There are some breeding bird locations identified during surveys which are associated with the existing trees, hedgerows, scrub, meadows, rush pasture, stone walls, water features, ditches and trees along field margins, and within less heavily grazed fields. It will be necessary to clear some areas of longer vegetation (typically rush or grasses) during the enabling works which will involve removing vegetation which could conceivably contain nesting (or wintering) species.

282. The Wildlife (Northern Ireland) Order 1985 legislation (as amended) with the exception of species listed in Schedule 2, and for certain specified purposes under licence, makes it an offence to intentionally or recklessly:

- kill, injure, or take any wild bird;
- take, damage, destroy or otherwise interfere with the nest of any wild bird while that nest is in use or being built (or at any other time in relation to habitually used nests by a wild bird listed on Schedule A1);
- obstruct or prevent any wild bird from using its nest or;
- take or destroy an egg of any wild bird.

283. Where necessary locations can readily be protected from direct impacts during the initial decommissioning and construction phases by the spatial protection of key wintering or breeding habitats and temporal restrictions. There is a small number of locations with the potential for birds to be disturbed. However, it should be noted that parts of the site are used routinely by agricultural users and as such birds are habituated to some levels of disturbance, nevertheless any works should avoid damage to any likely habitats, particularly during the breeding season, unless appropriately mitigated, as a result a Construction Mitigation Strategy is proposed.

9.6.1 Construction Mitigation Strategy (CMS)

284. It is likely that the proposed development footprint will be impacted by (i) pre-construction (site clearance) activities (ii) decommissioning/construction activities and (iii) operational activities and usage. Birds are able to more readily move away from disturbance sources during the winter and from foraging habitats but less so when confined to a breeding site or nest site and thus disturbance effects may be lower over the winter period (September – February) each year rather than during the breeding season (March – August). In the first instance the development has avoided high risk ornithological habitats and particularly since much of the proposed Development follows the route of existing windfarm access tracks and footprint thereby minimising overall effects.

[67] Welstead, J., Hirst, R., Keogh, D., Robb, G. & Bainsfair, R. (2013). Research and guidance on restoration and decommissioning of onshore wind farms. *Scottish Natural Heritage Commissioned Report No*. 591.

- Preparation of a final ornithological mitigation and monitoring plan (OMMP; including CMS, BMP and OMP) in consultation and by written agreement with the planning authority prior to works commencing;
- Disturbance to breeding birds typically can occur between1st March to 31st August each year and to avoid disturbance and/or damage to birds and/or nests during the breeding season it is recommended that spatial or temporal restriction are implemented;
- However, it is recognised that works during the breeding season may be necessary as outlined within **Chapter 3**;
- In the first instance the Development has been sensitively designed to avoid key ornithological features or bird-habitat features, avoiding ornithological habitats, where possible, e.g. woodland, hedgerows, scrub, stone walls, and utilising improved pasture fields and/or existing infrastructure / tracks which presently have limited suitability for nesting birds;
- Key features will be checked again prior to decommissioning/construction works commencing, and during the breeding season;
- Where possible, enabling and construction works will take place outside of the breeding season to avoid disturbance or displacement of breeding birds i.e. to take place between September and February;
- It is noted that management of longer vegetation in the area (outside the breeding season) is already typically cut as part of existing agricultural activities (e.g. rush topping) or already grazed by livestock and these activities also would reduce risks of nesting birds. Thus risks of the occurrence of nesting birds along the proposed Development footprint are negligible and largely restricted to new areas of the proposed Development;
- However given the relatively small footprint of any new Development area and the relatively small numbers of bird breeding locations (**Technical Appendix A9.1**) breeding season decommissioning /construction activities may be possible, and any restrictions on activities occurring within the breeding season (1st March to 31st August) could be relaxed, subject to check surveys being undertaken, provided extant habitats are deemed unoccupied by breeding birds and/or extant species are proven to be non-breeding as determined by a qualified ornithologist under licence, where required from the Northern Ireland Environment Agency (NIEA).The ornithologist will be appointed to oversee enabling works, site clearance, and to maintain on-going checks for nests along the route to avoid both disturbance and displacement and in order to implement any nest specific mitigation measures required;
- If any nests are located, no works will be undertaken until the status of those nests are obtained and a clear written protocol is established for each nest including maps and distances to the proposed works;
- Where necessary it is essential that spatial and temporal restriction dates are species-specific and agreed, in writing, with NIEA;
- Where necessary, the mitigation protocol will consider the following options (i) spatial relocation of works if nests are located less than recommended buffer distances by agreement with NIEA (e.g. snipe 400 m; curlew 800 m) or (ii) order to avoid disturbance and/or destruction nests will be monitored until nestlings have fledged and works will only be undertaken after fledging in the vicinity of the identified nests; (iii) any protocol or licences or other legislative requirements will be discussed with NIEA wildlife team and agreed in writing before commencement of works;
- A map of indicative bird locations, nests and/or sensitive habitats, derived from this report and the any other pre-construction nest check or monitoring studies, will be provided before decommissioning/construction commences and supplied to contractors including relevant spatial buffers, where required;
- The ornithologist will advise the Applicant and all contractors of the indicative locations of significant bird species and habitats prior to the commencement of works. This will be done by the provision of maps and an induction talk on wildlife law and disturbance to birds.

285. It is proposed to quantify bird distribution and abundance post-construction to validate any effects of the construction mitigation strategy and residual effects (Section 9.6.2). Based on site-specific evidence it is likely birds will habituate to the presence of the turbines and infrastructure in due course.

286. With recommended mitigation measures employed the impact on breeding birds is reduced to negligible and therefore not significant, but this requires to be monitored in the post-construction period to examine residual effects, if any.

9.6.2 Monitoring

287. It is difficult to predict the actual effects of displacement and/or collision in the absence of monitoring data, for example the utility of historical monitoring at Corkey may have provided further insights into the ontogeny of habituation and recovery of observed bird species within the Operational Corkey Windfarm. Collision risk can be dictated by individual turbine and/or windfarm configuration and therefore highly site-specific.

288. Monitoring measures are recommended to validate the actual disturbance / displacement and/or collision risk, if any, of birds, at the Development. This monitoring will establish the residual significance of effects, if any, and used to inform subsequent responses, if any. It is recommended that further monitoring is prescribed as part of the planning conditions.

289. Whilst it is recognised that monitoring post construction to quantify effects, if any, of repowering may be useful in informing the knowledge base, particularly in relation to the first repowering projects in Northern Ireland it is important that monitoring is undertaken to include specific objectives which are measurable and meet a particular monitoring need. It is recognised that there is a range of published literature and reviews on the effects of windfarms and wider monitoring information is desirable.

290. It is also recognised that extensive reviews of historical monitoring (www.swbsg.org) and emergent research (Whitfield et al., in prep) has revealed the difficulties with assessing the nature and extent of change within post-construction monitoring works especially where small numbers of birds / territories occur i.e. small sample sizes. Furthermore the difficulties associated with obtaining a matched / comparable control / reference site are difficult particularly likely to occur where the baseline is an operational windfarm (e.g. Corkey Operational Windfarm) alongside inter-annual variability (i.e. natural population variation) and extrinsic factors in defining the cause and effect associated with observed changes due to wind turbines / windfarms.

291. The key minor effects (**Table 9.9**) that are predicted at the Development are minor construction mediated disturbance and/or displacement effects on red grouse, snipe and small passerines and minor collision risk effects to secondary species (buzzard, kestrel and raven in particular).

292. It is recognised that the proposed habitat management and restoration measures for priority habitats will help maintain the snipe population and could also have potential beneficial effects on other species in the vicinity. It is hypothesised that the habituation observed in the site during baseline will re-occur within a short temporal time frame post-construction (1-3 years).

293. Specifically, the objectives for monitoring are that snipe, red grouse and small passerine populations (particularly meadow pipit) on the site should be maintained at the minimum baseline levels (**Technical Appendix A9.1; Table 9.7**), and/or increased post-construction. Trends will be reported, reviewed and a reactive management strategy deployed if necessary. This should include, but not be limited to further habitat and/or agricultural management f if necessary.

294. The Ornithological Monitoring Plan (OMP) includes, but is not limited to monitoring of snipe, red grouse and small passerines at the Development to assess effects of construction and/or Construction Mitigation Strategy (CMS) and to implement an on-going and continual monitoring protocol (BMP; **Technical Appendix A9.4**) throughout the operational lifetime of the windfarm to assess effects of collision, if any, during the operational phase.

295. The dOMP is outlined here to include, but not limited to:

- Preparation of a final ornithological mitigation and monitoring plan (OMMP; including CMS, BMP and OMP) in consultation and by written agreement with the planning authority in consultation with relevant consultees prior to construction commencement;
- Monitoring using methods as detailed in these baseline studies (**Technical Appendix A9.1**) in order to provide comparable data during construction and post-construction phase in order to inform comparative reporting against baseline results;
- Standardised data will be collected within the 500 m Survey Area to include all Development infrastructure and a 500 m buffer;
- Monitoring specific spatial and temporal data during the construction and post-construction periods to monitor the effects, if any, within the 500 m Survey Area of specific species / assemblages that have been identified at risk of disturbance and/or displacement and/or collision at the Development (**Table 9.9**);
- Monitoring during years zero (construction), year one, year two and year three.
- Review of the findings after year three and compare these to the baseline (**Technical Appendix A9.1**) and then implement further monitoring and review programme and/or habitat / species specific management as required.
- Monitoring, review and management until such time as populations are at the minimum levels recorded during the baseline studies (**Technical Appendix A9.1**);
- Monitoring distribution and abundance data of target species including for snipe, red grouse and small passerines;
- Monitoring spatial distribution and abundance of priority species breeding within appropriate buffers to specifically include, but not limited to: red grouse (500 m) and snipe (500 m) within the 500 m Survey Area;

- Monitoring spatial distribution and number of breeding meadow pipit and skylark and other passerines within the 500 m Survey Area;
- After year three the Applicant will then implement an extensive review to examine trends and findings. Further monitoring and management may then be implemented pending results to examine post-construction effects, if any;
- Annual reporting, analysis, review and response strategy, to include liaison with stakeholders and statutory authorities;
- Publication and reporting on the outcome of this monitoring to establish the effects, if any, of the Development to inform best practice and future management.

296. In the wider absence of empirical mortality data (Stewart et al., 2007), particularly in Northern Ireland (Ruddock & Reid, 2010) and the negligible effects of collision, on primary ornithological receptors and minor – negligible effects predicted for three secondary ornithological receptors (buzzard, kestrel, raven) it is recommended to include monitoring **(Technical Appendix A9.4)** to quantify actual collision rates, if any, of all species.

297. The dOMP is outlined here to include, but not limited to:

- Preparation of a final ornithological mitigation and monitoring plan (OMMP; including CMS, BMP and OMP) in consultation and by written agreement with the planning authority prior to construction commencement;
- Routine searches below turbines and windfarm infrastructure throughout the operational lifetime of the windfarm;
- Estimates of scavenger removal rates on Site;
- Estimates of searcher efficiency on Site;
- Protocol for searching, handling, recording and reporting of all dead birds, if any, found at the windfarm; this protocol is already in place for SPR Operational Corkey Windfarms (**Technical Appendix A9.4**);
- Annual review (and whenever mortality is recorded) for it to be reported and a reactive management strategy deployed;
- Reactive management should include, but not be limited to the creation of a theoretical population model for collision affected species, in Northern Ireland, which integrates the observed mortality data and to inform reactive response strategy;
- Annual reporting, analysis, review and response strategy, to include liaison with stakeholders and statutory authorities;
- Publication and reporting on the outcome of this monitoring to establish the effects, if any, of the Development to inform best practice and future management.

9.7 Cumulative Effect Assessment

298. There are six key ornithological receptors (snipe, red grouse, curlew, hen harrier, merlin, and peregrine) which are reviewed for cumulative effects; within 500 m, 800 m and 2 km Survey Areas are considered. Hen harrier and merlin are further considered up to a 5 km Survey Area and in relation to the nearby Antrim Hills SPA.

299. There are a number of operational, consented and proposed turbines in the wider landscape (**Technical Appendix A2.1**) with an Operational Windfarm at Gruig (10 turbines) and two other single operational turbines recorded within 500 – 800 m of the Development. One additional operational turbine is recorded within 2 km and others just beyond 2 km. Altaveeden windfarm (9 turbines) is located just beyond 5 km. These locations were plotted in order to consider any cumulative spatial overlap with ornithological receptors.

300. There are some spatial overlaps with Gruig and the single turbines within the 500 m turbine buffers between one and two of the same pairs of snipe as recorded within the Operational Corkey Windfarm 500 m buffers. In some years, other single turbines nearby (which have been erected after the Operational Corkey Windfarm) are also spatially located within 500 m of two to three other snipe territories which are beyond the existing turbine 500 m buffer. This species therefore appears to exhibit habituation to some of these single turbines although it is noted that recently (2018) snipe are c400-500 m away from the recently erected single turbines on the north-western side of the Site but these snipe have been recorded within a relatively short temporal period of the erection of those turbines.

301. Based on available cumulative data there is not considered to be any significant cumulative increased effect on snipe regionally, although up-to-date territory statistics from all sites and a wider cumulative assessment for Northern Ireland as a whole would be required to assess cumulative displacement predictions (Pearce-Higgins et al., 2009) or population-level effects. There are no additional snipe territories predicted to be displaced at Corkey thereby eliminating any cumulative effect.

302. In relation to red grouse, some of the turbines at Gruig are spatially concurrent with some red grouse recorded in this survey and also a number of additional red grouse within the Gruig windfarm area. The focus of the surveys here were within 500 m and therefore other red grouse may occur in the wider landscape not recorded in these surveys.

303. For curlew recorded in the area, Corkey operational and proposed turbines are further away from curlew territories than some of the single turbines and also Gruig turbines are located between Corkey and the curlew territory to the east. The curlew territory was recorded within 500 m of the Gruig windfarm in some years. Altaveeden windfarm occurs closer to curlew territories than Corkey, with three pairs directly located in the footprint of the windfarm during baseline studies. There are no significant cumulative implications from the Corkey repowering in relation to curlew and therefore no cumulative effects could arise on this species.

304. For hen harrier there are other single turbines, and other windfarms (including Gruig and Altaveeden) recorded closer to the identified hen harrier territories. All of the turbines are outside of the SPA. Any individual or cumulative collision risk is reduced particularly by the reduction of hen harrier collision risk due to the proposed Development (**Technical Appendix A9.3**). Altaveeden turbines are located closer to the northern hen harrier territory identified during Corkey surveys and the Altaveeden boundary is closer to the Antrim Hills SPA (immediately adjacent) than Corkey. All turbines are located further away than best practice guidance and requisite set-backs (>500 m).

305. Similarly, for merlin, Gruig turbines are recorded closer to the identified merlin territory and therefore the proposed Development has lesser potential effects compared to the other sites nearby. All turbines are located further away than best practice guidance and requisite set-backs (300-500 m). The proposed Development creates no additional cumulative effects on either of the designated site species for the Antrim Hills.

306. The Development site is located further away from the peregrine falcon territory than other single turbines, which have been erected in recent years; these turbines occur closer to the Corkey operational and/or proposed turbines. Peregrines are known to occur much closer (<100 m) at other breeding sites in Northern Ireland than any of the cumulatively located turbines at Corkey. No significant cumulative displacement effects are thus likely.

307. The proposed Development has enacted appropriate set-back distances to known priority species including hen harrier, merlin, curlew and other raptor territories and with the implementation of appropriate measures will reduce any predicted effects to negligible. No cumulative effects are therefore predicted.

308. There are considered to be no specific cumulative effects on individual birds or territories as a result of the Development. As outlined above the reduction in the numbers of turbines, results in increases in spatial separation / set-back distances to some species including snipe and red grouse. There are fewer turbines proposed and collision risk for key species, including hen harrier are actually lower. Therefore, the potential for any cumulative effects resulting from the addition of the proposed Development are actually further diminished.

309. In the absence of wider national cumulative impacts of windfarm developments data, and/or specific bird population thresholds of mortality there is currently considered to be no national, regional or local significant cumulative effect on any known breeding bird population. There are no other predicted cumulative effects for other species on basis of currently available data.

9.8 Summary of Effects

310. It is predicted that any effects of the Development during the decommissioning/construction phases will be negligible for a temporary time period (i.e. until decommissioning and construction works are completed) on the breeding or wintering species within the Development area, construction footprint and 500 m buffer due to availability of other suitable habitats nearby and/or conservation status.

311. From the primary field surveys and assessment there are considered to be negligible effects on extant bird species. However, some minor effects are predicted for the construction phase on snipe, red grouse and small passerines, including meadow pipit and skylark and some collision risks were predicted for buzzard, kestrel and raven, which are nesting within 2 km the Survey Area although two of these species showed evidence of avoidance.

312. There are no raptors or other priority species that will be directly impacted by the Development. The majority of species are avoided by appropriate buffer distances to turbines (**Technical Appendix A9.1**). Specifically, the raptor and wader known

breeding locations will not be directly affected by the proposed Development subject to mitigation measures being implemented during these phases (**Section 9.7**).

313. Several species including red grouse, snipe, peregrines and hen harriers have been recorded nesting within 50-300 m of existing turbines in Northern Ireland including at Corkey (M. Ruddock, personal observation) thus no long-term implications are predicted following cessation of decommissioning/construction activities and given the observed set-back distances for all priority species including hen harrier and merlin at the adjacent Antrim Hills SPA.

314. Specific measures to further reduce assessed effects including management of habitats, which will benefit snipe, and set-back distances and seasonal and spatial restrictions on decommissioning/construction activity are proposed. The proposed windfarm design has incorporated ornithological constraints, where possible, including avoidance of extant priority species and bird-habitats.

315. Measures are proposed where minor adverse effects are predicted on the basis of published research and/or site specific evidence, this specifically includes construction management strategy to avoid disturbance to snipe, red grouse and small passerines. In order to further examine residual effects, if any, a comprehensive bird monitoring programme (**Section 9.7; Technical Appendix A9.4**) has been outlined.

316. Throughout the operational phase a minor adverse with low magnitude but reversible effect remains in the absence of appropriate mitigation during the decommissioning/construction phases. Residual effects with the implementation of a construction management plan, supported by the HMP to support habituation result in negligible effects.

317. There are considered to be no significant effects of the proposed Development on ornithology, subject to implementation of the measures and monitoring recommendations outlined within this chapter, which can be secured via appropriately worded planning conditions.

318. **Table 9.9** provides a summary of the effects detailed within this chapter and identifies both the embedded and proposed measures set out in this chapter.

Table 9.9: Summary of Effects

Receptor	Potential Effect	Significance of Effect	Proposed Measures / Embedded Mitigation	Residual Effect
Decommissioning / Construction Phase				
Hen harrier	Disturbance Displacement	Minor risk of disturbance Minor risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Merlin	Disturbance Displacement	Minor risk of disturbance Minor risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Peregrine	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None -Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Buzzard	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Kestrel	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Sparrowhawk	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Raven	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Golden plover	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	No breeding birds on site; passage and over-wintering presence only Evidence of habituation and negligible effects	Negligible Negligible
Curlew	Disturbance Displacement	Minor risk of disturbance Minor risk of displacement	None - Avoidance by design (>800 m) Maintenance of set-back >800 m	Negligible Negligible
Snipe	Disturbance Displacement	Minor - negligible risk of disturbance Minor - negligible risk of displacement	Avoidance by CMS Avoidance by CMS	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Red grouse	Disturbance Displacement	Minor – negligible risk of disturbance Minor - negligible risk of displacement	Avoidance by CMS Avoidance by CMS	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Whooper swan	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Greylag goose	Disturbance Displacement	Negligible risk of disturbance Negligible risk of displacement	None - Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible
Meadow pipit	Disturbance Displacement	Minor - negligible risk of disturbance Minor - negligible risk of displacement	Avoidance by CMS Avoidance by CMS	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Skylark	Disturbance Displacement	Minor - negligible risk of disturbance Minor - negligible risk of displacement	Avoidance by CMS Avoidance by CMS	Negligible; Monitoring post-construction Negligible; Monitoring post-construction

Receptor	Potential Effect	Significance of Effect	Proposed Measures / Embedded Mitigation	Residual Effect
Small passerines	Disturbance Displacement	Minor - negligible risk of disturbance Minor - negligible risk of displacement	Avoidance by CMS Avoidance by CMS	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Operational Phase				
Hen harrier	Displacement Collision	Minor risk of displacement Minor risk of collision	Avoidance by design (>500 m); HMP beneficial for hen harrier Maintenance of set-back >500 m	Negligible; 1ha of difference between operational / proposed displacement; Negligible; Monitoring post-construction
Merlin	Displacement Collision	Minor risk of displacement Minor risk of collision	Avoidance by design (>500 m); HMP beneficial for hen harrier Maintenance of set-back >500 m	Negligible Negligible; Monitoring post-construction
Peregrine	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible; Negligible; Monitoring post-construction
Buzzard	Displacement Collision	Minor - negligible risk of displacement Minor - negligible risk of collision	Avoidance by design (>500 m); avoidance behaviour observed Maintenance of set-back >500 m; avoidance behaviour observed; removal of carrion; perch management	Negligible Negligible; Monitoring post-construction
Kestrel	Displacement Collision	Negligible risk of displacement Minor - negligible risk of collision	Avoidance by design (>500 m) Maintenance of set-back >500 m; perch management / deterrents	Negligible Negligible; Monitoring post-construction
Sparrowhawk	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible; Monitoring post-construction
Raven	Displacement Collision	Negligible risk of displacement Minor – negligible risk of collision	Avoidance by design (>500 m); avoidance behaviour observed Maintenance of set-back >500 m; avoidance behaviour observed; removal of carrion;	Negligible Negligible; Monitoring post-construction
Golden plover	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Low risk species; habituated Low risk species; habituated	Negligible Negligible; Monitoring post-construction
Curlew	Displacement Collision	Minor risk of displacement Minor risk of collision	Avoidance by design (>800 m) Maintenance of set-back >800 m	Negligible Negligible; Monitoring post-construction
Snipe	Displacement Collision	Minor - negligible risk of displacement Negligible risk of collision	HMP beneficial to snipe; disturbance management; Low level flights – no risk of collision	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Red grouse	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Low sensitivity to windfarm effect; HMP beneficial to red grouse; disturbance management; Low level flights – no risk of collision	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Whooper swan	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible; Monitoring post-construction
Greylag goose	Displacement Collision	Negligible risk of displacement Negligible risk of collision	Avoidance by design (>500 m) Maintenance of set-back >500 m	Negligible Negligible; Monitoring post-construction
Meadow pipit	Displacement Collision	Minor - negligible risk of displacement Negligible risk of collision	HMP beneficial to meadow pipit; disturbance management; Unlikely risks of collision	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Skylark	Displacement Collision	Minor - negligible risk of displacement Negligible risk of collision	HMP beneficial to skylark; disturbance management; Unlikely risks of collision	Negligible; Monitoring post-construction Negligible; Monitoring post-construction
Small passerines	Displacement Collision	Minor - negligible risk of displacement Negligible risk of collision	HMP beneficial to small passerines; disturbance management; Unlikely risks of collision	Negligible; Monitoring post-construction Negligible; Monitoring post-construction

9.9 Statement of Significance

319. From the primary field surveys and assessment there are considered to be negligible effects on extant bird species. However, some minor to negligible effects are predicted for some species, mainly due to decommissioning and construction activities on snipe, red grouse and small passerines and some collision risk for secondary species, which are nesting within the 2 km Survey Area. These predicted effects have incorporated specific measures to reduce likelihood and magnitude of effects including spatial and temporal construction management; management of habitats (as part of an HMP) which will benefit snipe and other species, and all priority species are spatially protected by appropriate set-back distances.. In addition various management and monitoring measures are outlined for implementation as part of the windfarm operational policies.

320. The proposed windfarm design has incorporated ornithological constraints, where possible, including avoidance of extant priority species. Further measures are outlined where minor effects are predicted on the basis of published research and to

prevent nesting bird disturbance as required under wildlife legislation. In order to examine residual effects, if any, there is a comprehensive monitoring programme which has been detailed.

321. Based on available cumulative data there is not considered to be any potential for significant cumulative effects to arise. The further measures proposed will ensure that no cumulative effects resulting from the Development will arise. There are no other predicted cumulative effects for other species on the basis of currently available data.

322. There are considered to be no significant effects of the proposed Development on ornithology. The implementation of the further measures outlined within this chapter, and the proposed monitoring recommendations can be secured via planning conditions.

10 Noise

10.1 Introduction

1. This Chapter of the ES evaluates the effects of noise due to the Development. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus). The assessment considers the potential effects of the Development during the following development stages:

- Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

2. The decommissioning of the Operational Corkey Windfarm and the construction of the Development are likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these first two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

3. This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 3 Technical Appendices**:

- Technical Appendix A10.1: Survey Record sheets; and
- Technical Appendix A10.2: Cumulative Noise Emission Data.

This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects (this includes cumulative effects);
- Mitigation and Residual Effects;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

4. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

10.2 Legislation, Policy and Guidance

5. The guidance, legislation and information sources set out in the following sections have been considered in carrying out this assessment.

10.2.1 Construction Noise

- The Environmental Protection Act 1990 (EPA 1990)[1]; and
- BS 5228:2009+A1:2014[2].

10.2.1.1 The Environmental Protection Act 1990

6. The EPA 1990 specifies mandatory powers available to Local Authorities in respect of any noise that either constitutes or is likely to cause a statutory nuisance, which is also defined in the Act. A duty is imposed on Local Authorities to carry out inspections to identify statutory nuisances, and to serve abatement notices against these. Procedures are also specified with regards to complaints from persons affected by a statutory nuisance.

10.2.1.2 BS 5228:2009+A1:2014

7. BS 5228:2009+A1:2014 refers to the need for the protection against noise and vibration of persons living and working in the vicinity of, and those working on, construction and open sites. It recommends procedures for noise and vibration control in respect of construction operations. The discussion below relates mainly to Part 1- Noise, however, the recommendations of Part 2 in terms of vibration are broadly very similar.

8. The standard stresses the importance of community relations, and states that early establishment and maintenance of these relations throughout site operations would go some way towards allaying people's concerns. In terms of neighbourhood nuisance, the following factors are likely to affect the acceptability of construction noise:

- Site location, relative to the noise sensitive premises;
- Existing ambient noise levels;
- Duration of site operations;
- Hours of work;
- The attitude of local residents to the site operator; and
- The characteristics of the noise produced.

9. Recommendations are made regarding the supervision, planning, preparation and execution of works, emphasising the need to consider noise at every stage of the operation.

10. Measures to control noise are described, including:

- Control of noise at source by, e.g.:
- Substitution of plant or activities by less noisy ones;
- Modification of plant or equipment to reduce noise emissions;
- The use of noise control enclosures;
- The siting of equipment and its method of use;
- Equipment maintenance; and
- Controlling the spread of noise, e.g., by increasing the distance between plant and noise-sensitive premises or by the provision of acoustic screening.

11. The standard includes a discussion of noise control targets, and example criteria for the assessment of the significance of noise effects, which are not mandatory.

12. Methods of calculating the levels of noise resulting from construction activities are provided, as are source levels for various types of plant, equipment and construction activities.

10.2.2 Operational Noise

13. The following guidance, legislation and information sources applicable to operational noise have been considered in this assessment, as agreed during consultation with the Environmental Health Department of Causeway Coast & Glens Borough Council (CCGBC). Further details on the consultation process are presented in **Section 10.3.1**:

- Planning Policy Statement 18: Renewable Energy - Planning NI (PPS 18)[3] and its Best Practice Guidance[4];
- ETSU-R-97 The Assessment and Rating of Noise from Windfarms[5]; and
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise[6] and associated Supplementary Guidance Notes (SGNs).

[1] UK Government The Environmental Protection Act 1990
[2] BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites
[3] Department of the Environment, Planning and Environmental Policy Group, Planning Policy Statement 18, 'Renewable Energy', August 2009
[4] Department of the Environment, Planning and Environmental Policy Group, Best Practice Guidance to Planning Policy Statement 18, 'Renewable Energy', August 2009
[5] ETSU-R-97, The Assessment and Rating of Noise from Windfarms, ETSU for the DTI, 1996
[6] Institute of Acoustics, A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, 2013.

10.2.2.1 Planning Policy Statement 18: Renewable Energy - Planning NI

14. PPS 18 sets out the Department of the Environment's planning policy for development that generates energy from renewable resources that requires submission of a planning application and is therefore relevant to the Development.

15. The aim of PPS 18 is to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment. Its objectives include ensuring that the environmental and amenity impacts of renewable energy developments are adequately addressed.

16. Policy RE 1 states that renewable energy developments will be permitted provided that they do not result in an unacceptable adverse impact on *inter alia* human health or residential amenity. Such potential impacts are relevant in the context of a noise assessment. It goes on to state that the Best Practice Guidance to PPS 18 will be taken into consideration in assessing proposals.

17. Furthermore, applications for wind energy development will be required to demonstrate that *inter alia* the development has taken into consideration the cumulative impact of existing wind turbines, those which have permissions and are currently the subject of valid but undetermined applications, and that the development will not cause significant harm to the safety or amenity of any sensitive receptors arising from noise. Sensitive receptors include habitable (though not necessarily occupied) residential accommodation, future occupants of committed developments, hospitals, schools and churches.

10.2.2.2 Best Practice Guidance to PPS 18

18. The Best Practice Guidance (BPG) provides background information on the various renewable energy technologies that may come forward in Northern Ireland. Section 1 relates to applications for onshore wind energy and includes a discussion of various planning issues, including noise.

19. It states that well designed windfarms should be located so that increases in ambient noise levels are kept to acceptable levels with relation to background noise, normally achieved through good turbine design and ensuring adequate separation between turbines and noise-sensitive receptors. The characteristics of wind turbine noise are discussed, and it is stated that ETSU-R-97 makes a series of recommendations that can be regarded as relevant guidance on good practice and that it should be used in the assessment and rating of noise from wind energy developments. A summary of the recommendations of ETSU-R-97 is provided below.

10.2.2.3 ETSU-R-97

20. The assessment methodology for operational noise is described in ETSU-R-97 *'The Assessment and Rating of Noise from Windfarms'*. The aim of ETSU-R-97 is to provide:

21. *"Indicative noise levels thought to offer a reasonable degree of protection to windfarm neighbours, without placing unreasonable restrictions on windfarm development or adding unduly to the costs and administrative burdens on windfarm developers or local authorities".*

22. The report makes it clear from the outset that any noise restrictions placed on a development must balance the environmental effects of the development against the national and global benefits which would arise through the development of renewable energy sources.

23. Noise criteria (or limits) are specified, which are a combination of a margin of 5 decibel (dB) above the prevailing, wind speed-dependent background noise level and fixed lower noise limits that are applicable in low background noise situations. The fixed lower noise limits are defined as:

- 35 - 40 dB, LA90,10min during the day, with the value chosen dependent on the number of affected properties, the effect on the number of kWh (kilowatt-hours) generated and the duration and level of exposure;
- 43 dB, LA90,10min at night, a level chosen to safeguard against sleep disturbance; and
- 45 dB, LA90,10min , during both the day and night, at properties where the occupier has a financial involvement in the proposed development.

24. The specified noise limits relate to the cumulative effects of all wind turbines that affect a particular location.

25. To carry out a noise assessment in accordance with ETSU-R-97, the following steps are required:

- Specify the number and locations of the wind turbines;
- Identify the locations of the nearest, or most noise sensitive, neighbours;
- Determine the background noise levels as a function of site wind speed at the nearest neighbours, or a representative sample of the nearest neighbours;
- Determine the quiet day time and night-time criterion curves from the background noise levels identified at the nearest neighbours;
- Specify the type and noise emission characteristics of the wind turbines proposed for the site (or candidate turbine considered);
- Calculate the noise immission levels due to the operation of the wind turbines as a function of site wind speed at the nearest neighbours; and
- Compare the calculated noise immission levels with the derived criterion curves and assess in the light of relevant planning requirements.

10.2.2.4 A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise

26. The Good Practice Guide (GPG) was published by the Institute of Acoustics (IOA) in May 2013 and has been endorsed by the Northern Ireland Executive as current industry good practice. The guide presents current good practice in the application of ETSU-R-97 assessment methodology for wind turbine developments at the various stages of the assessment process. The recommendations provided in the GPG have been followed throughout this assessment.

27. In 2014, the IOA published a suite of six Supplementary Guidance Notes (SGNs) intended to support the GPG and provide additional clarification where considered necessary. The recommendations of the SGNs have been followed where relevant in this assessment.

28. The GPG provides advice on the assessment of cumulative noise impact, detailing a number of possible cumulative scenarios and recommended approaches. Advice is also provided with regard to the geographical scope of a cumulative noise assessment, to determine the area within which a cumulative noise assessment is necessary.

29. Where a new noise source is introduced to a given scenario with a noise level which is predicted to be 10 dB or more below the existing level, the increase in the total noise level is considered to be negligible. On this basis, the necessary extents of a cumulative noise assessment can be determined. Paragraph 5.1.4 of the GPG states, *"If the proposed wind farm produces noise levels within 10 dB of any existing wind farm(s) at the same receptor location, then a cumulative noise impact assessment is necessary".*

30. As stated in ETSU-R-97, noise from existing wind turbines should not form part of the background noise level from which noise limits for new wind energy developments are derived.

10.3 Assessment Methodology and Significance Criteria

10.3.1 Scoping Responses and Consultations

31. Consultation for this ES topic was initially undertaken through the Scoping process, with further consultation carried out to agree specific elements such as the selection of baseline noise monitoring locations with the organisations shown in **Table 10.1**.

Table 10.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
CCGBC	Scoping Response	CCGBC concurred with the noise-related elements of the Scoping report, including the proposed approach and methodologies. CCGBC highlighted Gruig Windfarm as an operational cumulative site with the potential to influence background noise levels.	The approach and methodologies presented in the Scoping report have been followed throughout this assessment.

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
		CCGBC concurred with the suggested approach to determine background levels by the subtraction of predicted noise levels due to the existing turbines from the measured background noise level as this is the most conservative means and most suitable methodology to ensure robust noise data.	Background noise levels have been corrected for the influence of the existing wind turbines, including, but not limited to Gruig Windfarm as noted by CCGBC. This process is described in **Section 10.5.**
CCGBC Environmental Health Officer (EHO)	Email 12/09/2017 Telephone 28/09/2017	An initial noise contour plot and three suggested baseline noise monitoring locations were provided to EHO on 12/09/2017. EHO was happy with suggested locations. An additional location to the south-west of the Development was requested to ensure cumulative effects could be accurately assessed in the event that these properties are predicted to experience cumulative noise level in excess of 35 dB, $L_{A90,10min}$.	Baseline noise survey was undertaken at the three agreed locations, plus a fourth location to the south-west of the Development as requested (210 Corkey Road).
CCGBC EHO	Email 28/02/2018 Telephone 29/03/2018	A summary of the baseline noise analysis and resulting charts was provided to EHO on 28/02/2018. Confirmation was received on 29/03/2018 that the EHO was happy with the baseline noise analysis, and agrees that baseline noise data measured at 210 Corkey Road should be discounted. Agreed to use 15 Reservoir Road as quietest proxy location.	Agreed baseline noise charts are presented in **Section 10.4**. Noise data from 210 Corkey Road has been discounted, as discussed in **Section 10.3.6.** Background noise levels measured at 15 Reservoir Road have been used as a worst-case proxy, being the quietest of the remaining three monitoring locations.

10.3.2 Scope of Assessment

32. The Development phases considered for the assessment of potential noise effects relating to the Development are described in Chapter **3: Development Description**, and summarised below:

- Effects during Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Effects during Construction of the Development (likely to occur in tandem with the above phase); and
- Effects during Operation of the Development (including the potential for up to 50 m micro-siting for all infrastructure).
- Decommissioning of the Development (Final Phase)

10.3.3 Elements Scoped Out of Assessment

33. The following elements have been scoped out of this assessment, in line with the approach agreed through the Scoping process.

10.3.3.1 Decommissioning/Construction Phase Noise

34. As the Development consists of the repowering of an existing windfarm, a number of elements of the existing site infrastructure such as access tracks will be reused, thereby minimising the amount of construction works required. In addition, due to the large separation distances from the Development site to the nearest noise sensitive receptors, no significant decommissioning/construction effects are anticipated. Notwithstanding this, a summary of best practice construction methods, along with a commitment to adhere to best practice in controlling noise from decommissioning/construction activities, as advocated by BS 5228, is presented in **Section 10.5.1**.

10.3.3.2 Low Frequency Noise and Infrasound

35. A study[7], published in 2006 by acoustics consultants Hayes McKenzie on behalf of the Department of Trade and Industry (DTI), investigated low frequency noise from windfarms. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines, but that complaints attributed to low frequency noise were, possibly due to a phenomenon known as Amplitude Modulation (AM), described in **Section 10.3.3.4**.

36. Bowdler *et al.*, (2009)[8] concluded that:

37. "*...there is no robust evidence that low frequency noise (including 'infrasound') or ground-borne vibration from windfarms generally has adverse effects on windfarm neighbours*".

38. In February 2013, the Environmental Protection Authority of South Australia published the results of a study into in infrasound levels near windfarms[9]. This study measured infrasound levels at urban locations and rural locations with wind turbines close by, and rural locations with no wind turbines in the vicinity. It found that infrasound levels near windfarms are comparable to levels away from windfarms in both urban and rural locations. Infrasound levels were also measured during organised shut-downs of the windfarms; the results showed that there was no noticeable difference in infrasound levels whether the turbines were active or inactive.

10.3.3.3 Vibration

39. Research undertaken by Snow in 1996[10] found that levels of ground-borne vibration 100 m from the nearest wind turbine were significantly below criteria for 'critical working areas' given by British Standard BS6472:1992 *Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)*, and were lower than limits specified for residential premises by an even greater margin.

40. Ground-borne vibration from wind turbines can be detected using sophisticated instruments several kilometres from the windfarm site as reported by Keele University[11]. This report clearly shows that, although detectable using highly sensitive instruments, the magnitude of the vibration is orders of magnitude below the human level of perception and does not pose any risk to human health.

10.3.3.4 Amplitude Modulation (AM)

41. In its simplest form, AM, by definition, is the regular variation in noise level of a given noise source. This variation (the modulation) occurs at a specific frequency, which, in the case of wind turbines, is defined by the rotational speed of the blades, i.e. it occurs at the rate at which the blades pass a fixed point (e.g. the tower), known as the Blade Passing Frequency. A certain level of AM is typically present in wind turbine noise, and is referred to as 'blade swish' in ETSU-R-97. The noise limits recommended in ETSU-R-97 account for blade swish effects.

[7] Hayes McKenzie (2006). 'The measurement of low frequency noise at three UK windfarms', Hayes Mckenzie, The Department for Trade and Industry, URN 06/1412, 2006.
[8] Bowdler et al (2009). 'Prediction and Assessment of Wind Turbine Noise: Agreement about relevant factors for noise assessment from wind energy projects'. Acoustics Bulletin, Vol 34 No2 March/April 2009, Institute of Acoustics.
[9] Environment Protection Authority (2013). 'Infrasound levels near windfarms and in other environments'. Available Online At: http://www.epa.sa.gov.au/xstd_files/Noise/Report/infrasound.pdf (Accessed on 26/06/2017).

[10] ETSU (1997), Low Frequency Noise and Vibrations Measurement at a Modern Windfarm, prepared by D J Snow.
[11] Microseismic and infrasound monitoring of low frequency noise and vibrations from Windfarms: recommendations on the siting of Windfarms in the vicinity of Eskdalemuir, Scotland". Keele University, 2005

42. A study[12] carried out in 2007 on behalf of the Department for Business, Enterprise and Regulatory Reform (BERR) by the University of Salford, which investigated the incidence of noise complaints associated with windfarms and whether these were associated with excessive levels of AM. The study defined AM as aerodynamic noise from wind turbines with a greater degree of fluctuation than normal at blade passing frequency (later referred to as 'Other AM' (OAM)). Its aims were to ascertain the prevalence of OAM on UK windfarm sites, to try to gain a better understanding of the likely causes, and to establish whether further research into OAM was required.

43. The study concluded that OAM had occurred at only a small number (4 of 133) of windfarms in the UK, and only for between 7% and 15% of the time. It also stated that, the causes of OAM are not well understood and that prediction of the effect was not currently possible.

44. This research was updated in 2013 by an in-depth study undertaken by Renewable UK[13], which has identified that many of the previously suggested causes of OAM have little or no association to the occurrence of OAM in practice. The generation of OAM is based upon the interaction of a number of factors, the combination and contributions of which are unique to each site. With the current state of knowledge, it is not possible to predict whether any particular site is more or less likely to give rise to OAM, and the incidence of OAM occurring at any particular site remains low, as identified in the University of Salford study.

45. In 2016, the IOA proposed an objective measurement technique[14] to quantify the level of AM present in any particular sample of windfarm noise. This technique is supported by the Department of Business, Energy & Industrial Strategy (BEIS, formerly The Department of Energy & Climate Change) who have published guidance[15], which follows on from the conclusions of the IOA study in order to define an appropriate assessment method for AM, including a penalty scheme and an outline planning condition. Notwithstanding this, the suggested outline planning condition is as yet unvalidated, remains in a draft form and would require site-specific legal advice on its appropriateness to a specific development.

46. Section 7.2.1 of the GPG therefore remains current, stating: "*The evidence in relation to 'Excess' or 'Other' Amplitude Modulation (AM) is still developing. At the time of writing, current practice is not to assign a planning condition to deal with AM*".

10.3.3.5 Energy Storage

47. As described In **Chapter 3: Development Description,** the Development includes an Energy Storage Unit. Based upon Arcus' substantial experience of such facilities, they emit relatively low levels of noise; the Energy Storage Unit is likely to comprise a number of containerised modules, with the primary noise source being the air conditioning units used to regulate the temperature of the storage system. Given this, coupled with the substantial (approximately 800 m) separation distance between the Energy Storage Unit and the closest noise-sensitive receptors, there is no reasonable prospect of a significant effect. This element has therefore not been considered further.

10.3.4 Study Area

48. The Study Area for the noise assessment is defined as the area in which cumulative windfarm noise levels could potentially exceed 35 dB(A), in accordance with ETSU-R-97 and in which the predicted noise levels from the Development are within 10 dB of those from other windfarms in the area, in accordance with the GPG. **Figure 10.1** illustrates this area, and identifies potential noise-sensitive receptors within the Study Area.

10.3.5 Design Parameters

49. The GPG notes that most sites at planning stage will not have selected a preferred turbine and therefore a candidate turbine representative of a range of turbines should be selected to provide appropriate noise levels. Once noise levels have been predicted at the potentially affected properties, compliance with noise limits can be assessed and design advice provided if compliance with the limits is considered unlikely.

50. The candidate wind turbine model for the purposes of assessment is the Vestas V117 4.2 MW with a hub height of 80 m, equating to the Development's maximum tip height of 137 m. This assessment assumes the turbines are fitted with the serrated trailing edge (STE) blades, and operates in full power mode at all times. The manufacturer's noise emission documentation excludes any margin for uncertainty, and as such an additional 2 dB has been included in the sound power levels in this assessment, as detailed in **Table 10.2**.

51. The noise emission documentation for the Vestas V117 4.2 MW is presented relative to hub height wind speeds. Following the procedure defined in the GPG, and for the purposes of assessment in accordance with ETSU-R-97 and the GPG, the sound power levels have been adjusted to standardised 10 m wind speeds.

Table 10.2: Noise Emission Data – Vestas V117 4.2, 80 m hub height

10 m AGL, Standardised Wind Speed, (ms^{-1})	3	4	5	6	7	8	9	10	11	12
Sound Power Level, L_{WA}, dB including 2 dB allowance for uncertainty	95.0	97.7	101.9	105.6	107.8	108.0	108.0	108.0	108.0	108.0

52. As no frequency spectrum data was available for the Vestas V117 4.2 MW, the spectrum of the V117 3.6 MW variant was used as the closest available alternative, and scaled to the maximum sound power level (including 2 dB to account for uncertainty) of 108.0 dB,L_{WA}, as presented in **Table 10.3**.

Table 10.3: Octave-Band Spectrum

Octave Band Centre Frequency, f, (Hz)	63	125	250	500	1000	2000	4000	8000
Octave-Band Sound Power Level, Scaled to 108.0 dB, L_{WA}	89.6	97.1	100.1	101.8	102.4	99.8	95.8	84.3

10.3.5.1 Micro-siting

53. As set out in **Chapter 3: Development Description**, a 50 m micro-siting allowance has been included to avoid any further unknown or unrecorded onsite environmental or technical constraints uncovered at the time of construction. In the event that a turbine is required to be micro-sited closer to any noise-sensitive receptor identified in **Table 10.7** of this Chapter than is currently proposed, predicted noise levels will be updated, and assessed against the noise limits specified in the Development's planning conditions. In the event that an exceedance of noise limits is identified, a noise mitigation scheme will be developed, operating one or more turbines in a reduced-noise mode under the required wind speeds and / or wind directions in order to ensure compliance with noise limits is maintained.

10.3.6 Baseline Survey Methodology

54. Potential noise-sensitive receptors are defined in PPS 18 as habitable residential accommodation (although not necessarily occupied), future occupants of committed developments, hospitals, schools and churches. Such buildings have been identified from Land and Property Services Northern Ireland PointerPLUS[16] data and plotted as shown in **Figures 10.1 and 10.2**.

55. From these, a representative selection of four properties have been identified for the purposes of baseline noise monitoring, as presented in **Table 10.4** and agreed in consultation with the CCGBC.

56. Background noise monitoring was carried out at these locations, in accordance with ETSU-R-97 and the GPG. The following specific measures ensured this compliance:

- Type 1[17] measuring equipment (Rion NL-31) was used, which was calibrated at the start of the survey and at each site visit. No significant calibration drift occurred (i.e. no more than 0.5 dB);

12 University of Salford (2007). 'Research into aerodynamic modulation of wind turbine noise'. Report by University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235, July 2007.
13 Renewable UK (2013). 'Wind Turbine Amplitude Modulation: Research to improve understanding as to its Cause and effects', Renewable UK, 2013.
14 Institute of Acoustics, (2016) A Method for Rating Amplitude Modulation in Wind Turbine Noise,
15 BEIS, (2016), Review of the evidence on the response to amplitude modulation from wind turbines,
16 A database which combines Royal Mail and Local Council address data with buildings identified on large-scale Ordnance Survey Northern Ireland Mapping and provides addresses, descriptions and grid references
17 As defined in BS EN 06651:1994 Specification for Sound Level Meters

- Noise monitoring equipment was equipped with specially-designed, dual-layer windshields manufactured by Rion, which have been confirmed by the supplier as being suitable for use in elevated wind speeds and meeting the requirements of the GPG;
- Measurements were performed at a height of 1.4 m AGL, in free-field conditions, i.e., a minimum of 3.5 m from any reflective surface other than the ground;
- Background noise levels were recorded at continuous 10-minute intervals, as $L_{A90,10min}$;
- During the survey, wind speeds were measured using an on-site meteorological mast. Measurements taken at a height of 80.9 m were considered as being equivalent to hub height (80 m) wind speeds, and used to calculate standardised 10 m wind speeds, following the procedure described in the GPG;
- Logging rain gauges were deployed at 42 Reservoir Road and 210 Corkey Road;
- Any periods of elevated background noise levels which were not considered representative of the location (e.g. lawn mowing) were identified and excluded from analysis; and
- The GPG recommends at least 200 valid data points in each quiet daytime and night time period for each monitoring location, after exclusions are taken into account. This was exceeded at all monitoring locations.

57. Survey record sheets and calibration certificates for noise and wind monitoring equipment used during the survey are included in **Technical Appendix A10.1**.

58. **Table 10.4** details the baseline noise monitoring locations.

Table 10.4: Baseline Noise Monitoring Locations

Location Name	Easting	Northing	Description of Monitoring Location
15 Reservoir Road	309638	422197	Grassed area to front (north) of house). Shielded from all operational turbines.
21 Reservoir Road	309966	422657	Grassed area to front (south-west) of house). Shielded from all operational turbines. Located as far as possible from burn running along northern edge of garden.
42 Reservoir Road	309748	422682	Grassed area to front (west) of house). Shielded from all operational turbines. Amenity area contained a number of trees – monitor located in adjacent field to avoided being too close to trees, whilst still being representative.
210 Corkey Road	309689	420972	Grassed area to side (south) of house to minimise noise from stream running by property entrance.

59. The background noise data were analysed according to the following process:

- Synchronisation of measured noise level ($L_{A90,10min}$), 10 m standardised wind speed, wind direction and rainfall data, correcting for differences in the timestamp averaging period (i.e. start or end of the 10-minute period) for each;
- Where a rain gauge was installed at a monitoring location, the rain data from the gauge has been applied directly. Where no gauge was installed, the rain data from the closest gauge was used;
- Exclusion of any 10-minute periods where rainfall was recorded, where rainfall was recorded in the preceding 10-minute period, and any other atypical periods judged to have been affected by rainfall or noise from watercourses;
- Elimination of any periods where the sound level meters recorded 'over-range' measurements as these are likely to be associated with short-duration, high intensity noise events or sources, such as barking dogs or machinery which may not be typical of the background noise environment;
- Exclusion of any data points which were considered ‘outliers’ relative to the overall dataset and located above the resulting trendline;
- Sorting of data into 'quiet daytime' and night-time periods, as defined in ETSU R-97;
- Preparation of an X-Y scatter plot of measured noise levels against standardised 10 m wind speed for quiet daytime and night-time periods;
- Application of a polynomial trendline to the plot, using Microsoft Excel's 'Trendline' function; and
- Determination of the prevailing background noise level from the trendline curve.

60. Following filtering, resulting charts were found to show a good correlation between noise level and wind speed, with the exception of 210 Corkey Road. The gradient of the background noise trendline was found to be substantially ‘flatter’ than the other locations, and with relatively high noise levels at low wind speeds (see **Charts 10.7 and 10.8** in **Section 10.4**). In light of this, it is likely that noise from the nearby watercourse is the primary source of noise at this location, and when compared to the other monitoring locations, may not be representative of typical background noise levels in the locality. It was therefore agreed with CCGBC that the data measured at this location would be discounted, and the quietest of the remaining three locations (15 Reservoir Road) used as a proxy.

10.3.7 Correction for Operational Turbines

61. It is a key principle of the ETSU-R-97 methodology that noise from operational wind turbines should not be regarded as a component of background noise. The measured background levels were therefore corrected to account for the noise for any existing operational wind turbines. This process is described in **Section 10.4**.

10.3.8 Methodology for the Assessment of Effects

10.3.8.1 Noise Limits

62. As discussed at **Section 10.2.2.3**, the noise limits described in ETSU-R-97 are a combination of a 5 dB margin above the prevailing wind speed-dependent background noise level and fixed lower limits, applicable where background noise levels are low. These limits apply to cumulative effects. The daytime fixed lower noise limit is defined as a value within the range 35 to 40 dB, $L_{A90,10min}$, with the value chosen dependent on the following three factors:

- The number of affected properties;
- The effect on the number of kilowatt-hours produced; and
- The duration and level of exposure.

63. These factors have been evaluated as follows:

- **The number of affected receptors**: **Figure 10.1** shows predicted cumulative noise level contours, and the locations of properties that have been identified as noise-sensitive receptors in terms of PPS 18. The number of such properties within the 35 dB(A) contour is relatively small, however a cluster of properties is located to the west of the Development. This factor therefore supports a fixed limit in the middle of the range defined in ETSU-R-97;
- **The effect on the number of kilowatt-hours produced**: As discussed in **Chapter 3: Development Description**, the Development is likely to have a total generating capacity of at least 20 MW which is relatively high, and substantially greater than the maximum capacity of the Operational Corkey Windfarm (5 MW). This suggests the application of a fixed limit towards the upper end of the defined range. However, it is also appropriate to consider whether a lower limit would constrain operation of the Development. It has been found that a cumulative fixed lower limit of at least 37 dB(A) would avoid the need for the Development to have its output constrained to reduce noise levels; and
- **The duration and level of exposure**: All properties within the cumulative 35 dB, $L_{A90,10min}$ contour are located to the north and west of the Development. Given that the prevailing wind direction in Northern Ireland is south-westerly, wind turbine noise levels would be considerably lower than predicted for a substantial proportion of the time, with noise levels when the receptors are upwind of the turbines being up to 10 dB lower than predicted. These factors tend to support a fixed lower noise limit at the upper end of the range.

64. Taking the above factors into consideration, a daytime fixed lower noise limit of 37 dB(A) is therefore considered to be appropriate in relation to cumulative noise.

65. With regard to financially involved properties, it is understood that the resident of 15 Reservoir Road has a financial interest in the turbine located on its own land (Application number D/2011/0043/F **Technical Appendix 2.3** for full details). For cumulative noise effects, this property is therefore subject to the increased fixed lower limit of 45 dB, L_{A90} for daytime and night-time periods.

66. For the assessment of the Development in isolation, none of the identified potential receptors have a financial interest in the Development. The most stringent fixed lower limits of 35 dB, L_{A90} during daytime periods and 43 dB, L_{A90} during night-time periods have been applied at all receptors.

10.3.8.2 Noise Predictions

67. Noise predictions have been made using the ISO 9613-2 noise model, taking account of the specific data and parameters recommended in the GPG, as summarised below:

- The turbine sound power levels should be stated and these should include an appropriate allowance for measurement uncertainty. If the data provided contains no allowance for measurement uncertainty, or uncertainties are not stated, an additional 2 dB should be included;
- Atmospheric absorption should be calculated based on conditions of 10°C and 70% relative humidity;
- The ground factor assumed should be G=0.5 (mixed ground) except in urban areas or where noise propagates across large bodies of water, where G=0 (hard ground) should be assumed;
- A receiver height of 4.0 m should be assumed;
- Barrier attenuation should not be included, unless there is no line of sight from the receptor, in which case a 2 dB barrier effect may be included;
- An additional 3 dB should be added to noise immission levels at properties located across a valley or with heavily concave ground between the receptor location and the wind turbine(s)[18]; and
- The predicted noise levels ($L_{Aeq,t}$) should be converted to the required $L_{A90,10min}$ by subtracting 2 dB.

68. ISO 9613-2 provides a prediction of noise levels likely to occur under worst-case conditions; those favourable to the propagation of sound, i.e., down-wind or under a moderate, ground-based temperature inversion as often occurs at night (often referred to as stable atmospheric conditions). The specific measures recommended in the GPG have been shown to provide good correlation with levels of wind turbine noise measured at operational windfarms[19,20].

10.3.8.3 Cumulative Noise Assessment

69. ETSU-R-97 states that the assessment should take account of the effect of noise from all wind turbines that may affect a particular receptor. In order to facilitate this, a screening exercise was conducted to identify any wind turbines either operational, consented, or subject of a current planning application, with the potential to result in cumulative noise effects when assessed in conjunction with the Development. **Technical Appendix A2.3: List of Cumulative Sites** contains the full list of windfarms and single turbines used to inform the wind turbines and windfarms identified.

70. The following cumulative developments were identified:

- Altaveedan Wind Farm;
- Gruig Wind Farm;
- 15 Reservoir Road (D/2011/0043/F) (single turbine); and
- 21 Reservoir Road (D/2013/0081/F) (single turbine).

71. In order to identify the area (and thereby the noise-sensitive receptors) requiring a cumulative assessment, a screening tool has been developed. This involves calculating noise grids for both the Development and the cumulative sites under consideration, based on the maximum sound power levels for the turbines from each development. The difference between the grid values is then calculated to identify the area in which the difference in noise levels is less than 10 dB, in line with the requirements of the GPG discussed in **Section 10.3.4**.

72. This 'difference map' is then overlaid with the cumulative 35 dB(A) contour. The area where the cumulative level is greater than 35 dB(A) and the difference between the Development and the cumulative sites is less than 10 dB defines the area with the potential for cumulative effects.

73. **Figure 10.1** presents the results of this screening process. The receptors with the potential to experience a cumulative noise effect are those located within both the blue area and the cumulative 35 dB(A) contour, from which a representative selection of these have been assessed.

74. Details of the noise emission data for each cumulative development has been sourced from the respective noise assessment for that development, and is presented in **Technical Appendix A10.2**.

10.3.8.4 Apportioned Noise Limits

75. Cumulative noise effects have been addressed through the derivation of apportioned noise limits. Apportioned noise limits are created by logarithmically subtracting the cumulative noise scenario (i.e., excluding noise due to the Development), from the cumulative noise limits (**Section 10.9**). The result is the remaining noise budget available to the Development. Should no additional noise budget be available at a given property, limits at that property for noise due to the Development are set 10 dB below the cumulative noise limit, ensuring that any contribution to cumulative noise due to the Development is negligible.

10.3.8.5 ESTU Limits and Significance

76. The acceptable limits for wind turbine operational noise are clearly defined in ETSU R-97. Therefore, this assessment determines whether the calculated immission levels at nearby noise sensitive properties lie below the noise limits derived in accordance with ETSU-R-97. Where the noise immission levels at noise sensitive properties are shown to be below derived noise limits the impact is considered to be not significant in terms of the EIA Regulations[21].

10.3.9 Assessment Limitations

77. Baseline noise monitoring locations were selected to provide a conservative representation of the background noise levels in the local area, and corrected to account for the influence of existing wind turbines, following advice contained within the GPG.

78. Valid background noise measurements were obtained during the baseline noise survey for the full range of wind speeds required by the GPG for both daytime and night time periods, after exclusions were taken into account.

79. Wind speeds were measured at a hub height of 80 m, and standardised to a height of 10 m in accordance with the GPG. It is therefore concluded that no significant assessment limitations exist.

10.4 Baseline Description

80. **Charts 10.1 to 10.8** detail the results of the background noise data analysis for quiet daytime and night periods, as defined in ETSU-R-97. The charts also show the cumulative noise limits applicable under ETSU-R-97, taking account of the appropriate daytime fixed lower noise limit identified in **Section 10.3.8.1**. It should be noted that no cumulative noise limit has been derived for the monitoring undertaken at 210 Corkey Road, as this dataset was discounted from further consideration (as set out in **Section 10.3.6**).

[18] Equation to determine concave ground as presented in Section 4.3.9 of the GPG.
[19] Bullmore et al. (2009). Wind Farm Noise Predictions and Comparison with Measurements, Third International Meeting on Wind Turbine Noise, Aalborg, Denmark 17 – 19 June 2009.
[20] Cooper & Evans (2013). Effects of different meteorological conditions on wind turbine noise.
[21] The Planning (Environmental Impact Assessment) Regulations 20152012

Chart 10.1: Quiet Daytime – 15 Reservoir Road

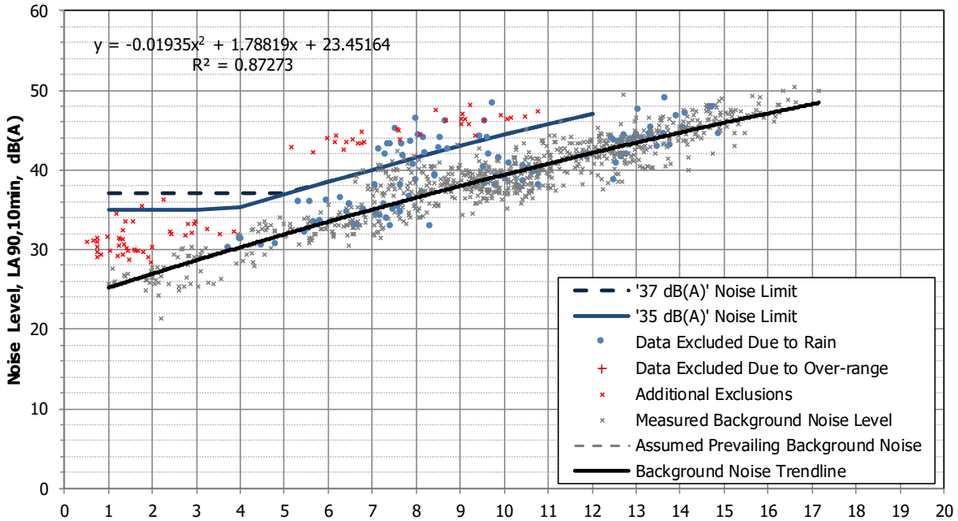


Chart 10.2: Night-time – 15 Reservoir Road

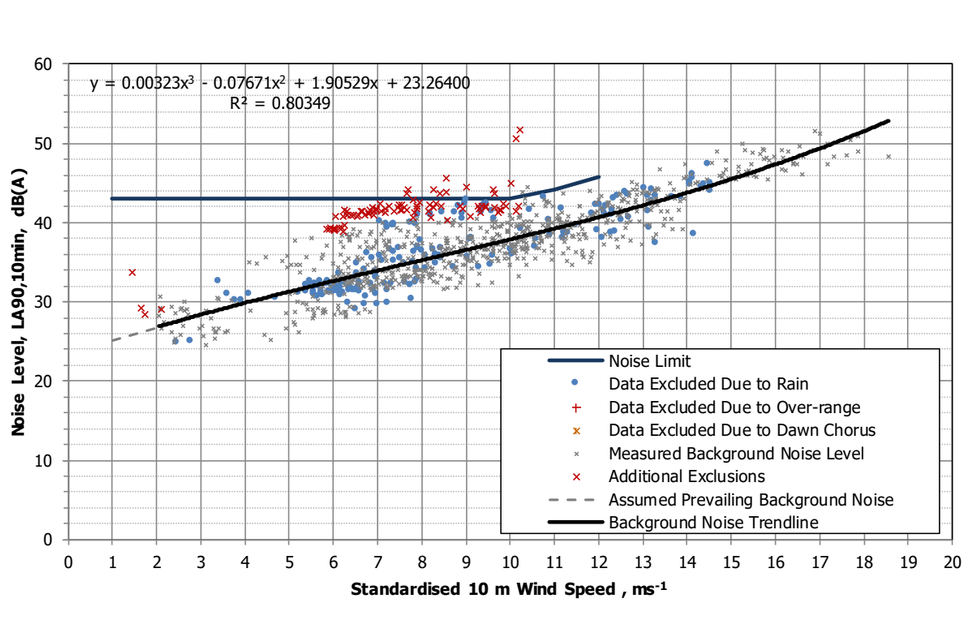


Chart 10.3: Quiet Daytime – 21 Reservoir Road

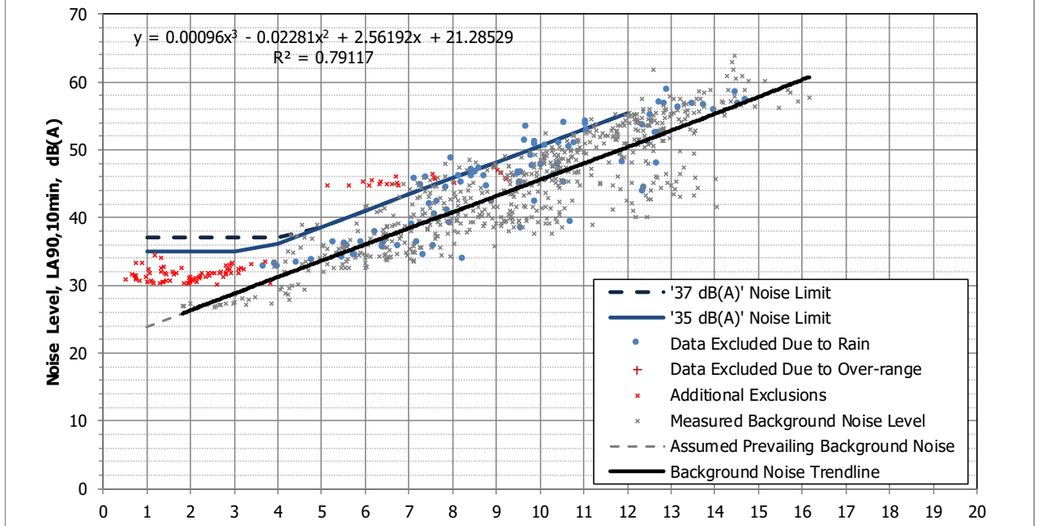


Chart 10.4: Night-time – 21 Reservoir Road

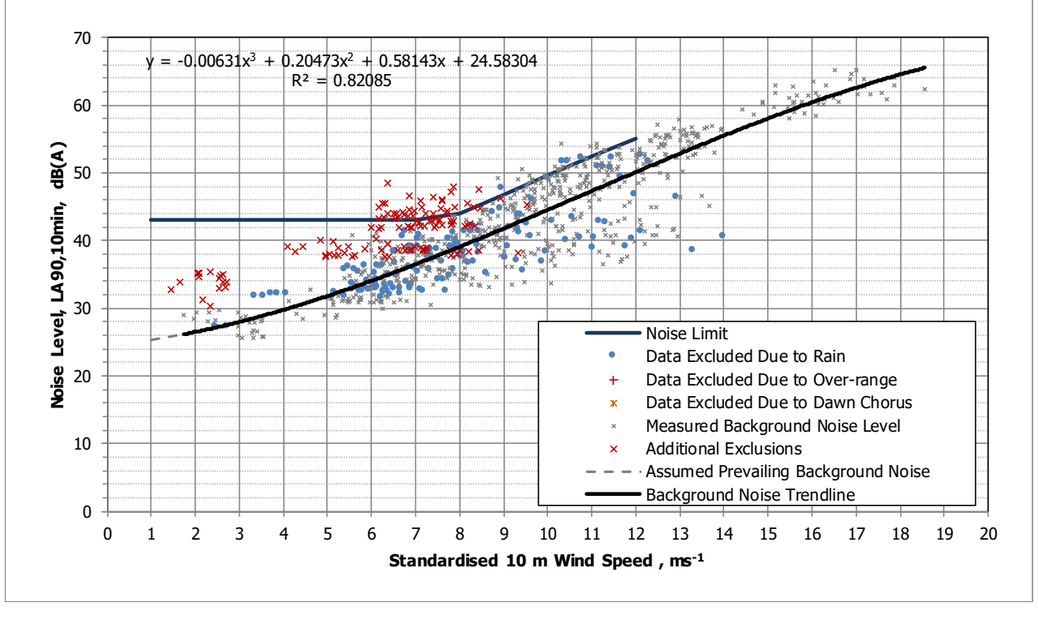


Chart 10.5: Quiet Daytime – 42 Reservoir Road

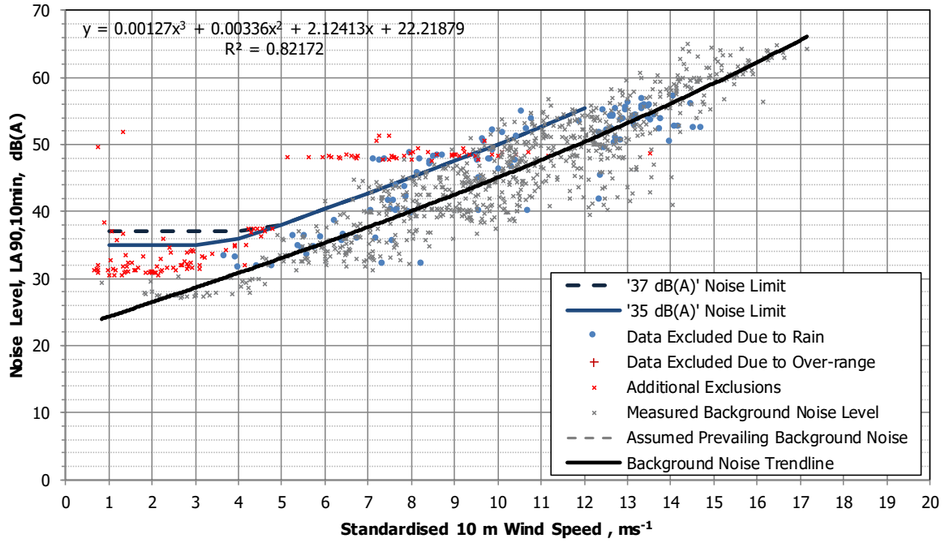


Chart 10.6: Night-time – 42 Reservoir Road

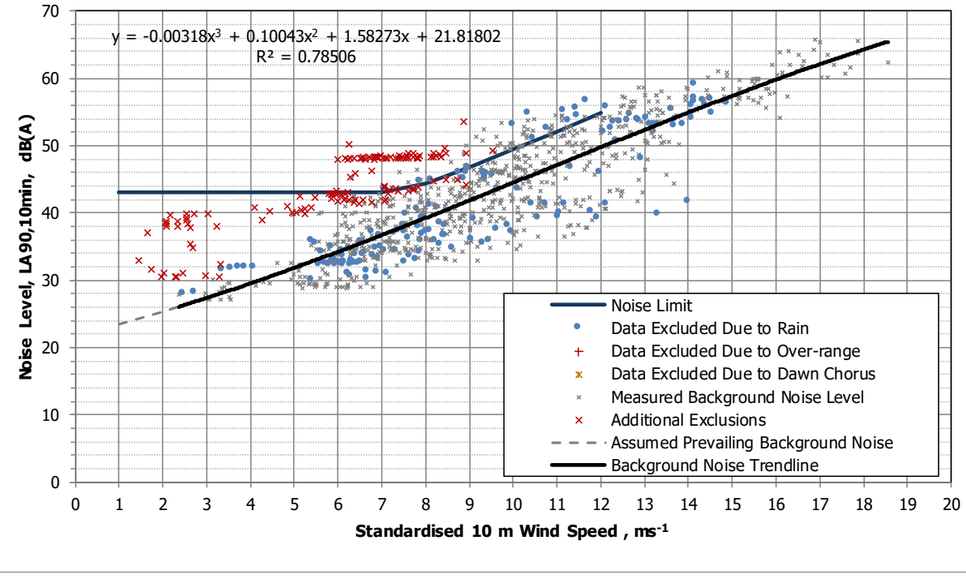


Chart 10.7: Quiet Daytime – 210 Corkey Road

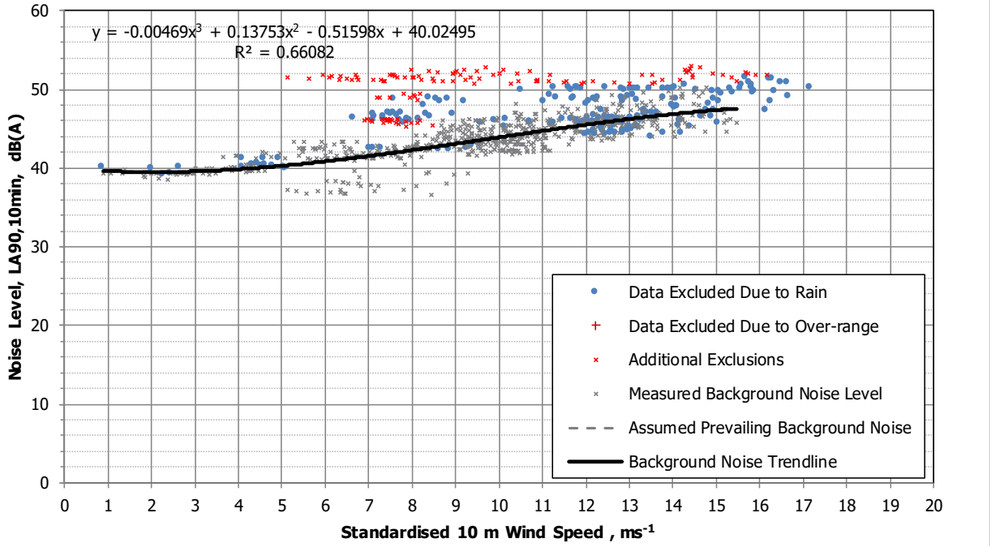
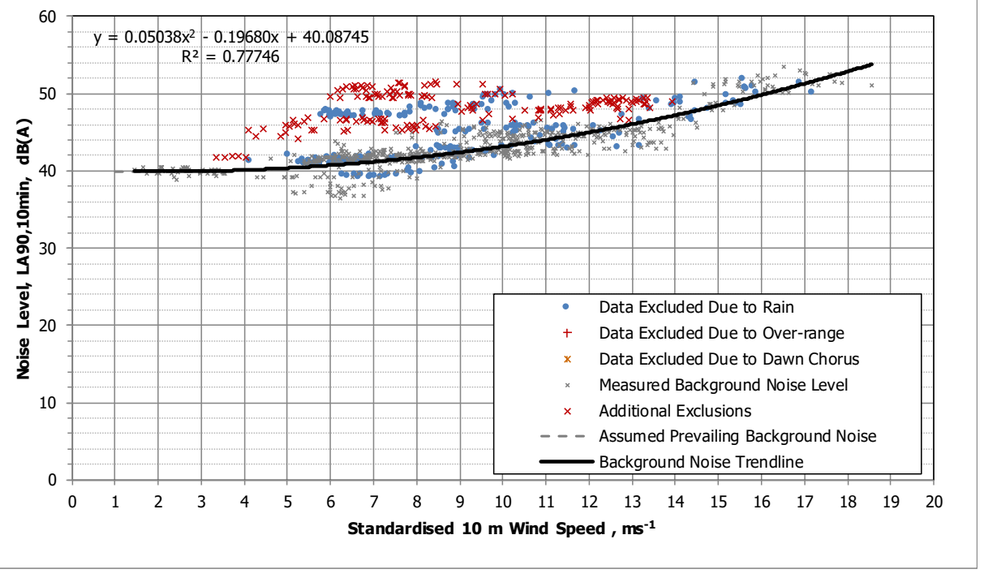


Chart 10.8: Night-time – 210 Corkey Road



81. It is a key principle of the ETSU-R-97 methodology that noise from operational wind turbines should not be regarded as a component of background noise. In addition to the Operational Corkey Windfarm, it was found that the operational Gruig Windfarm, situated approximately 1 km to the south-east of the Development, and single turbines located to the north[22] and west[23] of the Development may have the potential to influence background noise levels in the locality.

82. As such, the background noise monitoring locations were carefully selected to ensure all operational turbines were shielded from the monitoring location by the property itself. In addition, in order to ensure all contributions from existing wind turbines were fully excluded, it was agreed with CCGBC (See **Section 10.3.1**) that the existing level of wind turbine noise at each noise monitoring location would be predicted through noise modelling, and used to correct the measured background levels.

83. Wind turbine noise levels due to the existing scenario were calculated in accordance with the GPG, following the procedure described **in Section 10.3.8.2.** Details of the noise emission data for each operational development included in this process (including the Operational Corkey Windfarm) are presented in **Technical Appendix A10.2.**

84. Following noise modelling, it was found that for the majority of wind speeds for both daytime and night time periods, the predicted wind turbine noise level was substantially in excess of the measured background level, which cannot be the case in practice. This is considered to be primarily due to the fact that the noise monitoring locations were fully shielded from the operational wind turbines, whilst the noise model does not take into account the screening effect of buildings. Therefore, to account for these effects, a 10 dB attenuation was applied to the predicted noise levels, in line with GPG recommendations on screening effects.

85. For certain locations and wind speeds, it was found that following the 10 dB reduction, and due to the inherent conservatism in the GPG modelling parameters, predicted noise levels remained in excess of the measured noise level, or sufficiently close to the measured levels that a logarithmic subtraction could not be performed accurately (i.e., within 3 dB as advised in SGN 5 of the GPG). In such instances, the corrected background level was assumed to be 3 dB below the measured background level, on the assumption that the level of wind turbine noise is equal to the level of background noise This approach is supported by the fact that no wind turbine noise was audible at any monitoring location during site visits, suggesting that in practice, the level of existing wind turbine noise is below the level of background noise. In all other cases, the predicted noise level was logarithmically subtracted from the measured level.

86. **Table 10.5** details this process for each monitoring location, for daytime and night-time periods. The corrected background noise levels, highlighted in bold, were then used to derive the ETSU-R-97 limits, as presented in **Table 10.6**.

Table 10.5: Prevailing Background Noise Levels

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Prevailing Background Noise Level, dB, $L_{A90,10min}$									
15 Reservoir Road										
Quiet Daytime										
Measured Background Level	28.6	30.3	31.9	33.5	35.0	36.5	38.0	39.4	40.8	42.1
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	28.8	31.4	31.8	32.2	32.6	32.9	33.3	33.6	33.9	34.2
Corrected Background Level	**25.6**	**27.3**	**28.9**	**30.5**	**32.0**	**34.0**	**36.2**	**38.1**	**39.8**	**41.4**
Night-time										
Measured Background Level	28.4	29.9	31.3	32.6	34.0	35.3	36.6	37.9	39.2	40.7
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	28.8	31.4	31.8	32.2	32.6	32.9	33.3	33.6	33.9	34.2
Corrected Background Level	**25.4**	**26.9**	**28.3**	**29.6**	**31.0**	**32.3**	**33.8**	**35.8**	**37.7**	**39.5**
21 Reservoir Road										
Quiet Daytime										
Measured Background Level	28.8	31.2	33.6	36.0	38.4	40.8	43.2	45.6	48.0	50.4
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	26.0	27.1	27.6	28.0	28.4	28.9	29.3	29.5	29.7	29.9
Corrected Background Level	**25.8**	**29.1**	**32.4**	**35.3**	**38.0**	**40.5**	**43.0**	**45.5**	**47.9**	**50.4**
Night-time										
Measured Background Level	28.0	29.8	31.8	34.1	36.5	39.1	41.8	44.6	47.4	50.1
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	26.0	27.1	27.6	28.0	28.4	28.9	29.3	29.5	29.7	29.9
Corrected Background Level	**25.0**	**26.8**	**29.8**	**32.9**	**35.8**	**38.7**	**41.5**	**44.4**	**47.3**	**50.1**
42 Reservoir Road										
Quiet Daytime										
Measured Background Level	28.7	30.9	33.1	35.4	37.7	40.1	42.5	45.1	47.7	50.4
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	25.0	26.2	26.7	27.1	27.5	27.9	28.3	28.5	28.7	28.9
Corrected Background Level	**26.2**	**29.0**	**32.0**	**34.7**	**37.3**	**39.8**	**42.4**	**45.0**	**47.6**	**50.4**
Night-time										
Measured Background Level	27.4	29.6	31.8	34.2	36.7	39.3	41.9	44.5	47.1	49.8
Predicted Existing Turbine Noise Level, Including 10 dB Shielding	25.0	26.2	26.7	27.1	27.5	27.9	28.3	28.5	28.7	28.9
Corrected Background Level	**24.4**	**26.8**	**30.3**	**33.3**	**36.2**	**38.9**	**41.7**	**44.4**	**47.1**	**49.7**

87. **Table 10.6** details the corresponding ETSU-R-97 noise limits. It is from these limits that apportioned noise limits applicable to the Development are derived.

Table 10.6: Cumulative Noise Limits

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Cumulative Noise Limit, dB, $L_{A90,10min}$									
Daytime										
15 Reservoir Road	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.4
21 Reservoir Road	37.0	37.0	37.4	40.3	43.0	45.5	48.0	50.5	52.9	55.4
42 Reservoir Road	37.0	37.0	37.0	39.7	42.3	44.8	47.4	50.0	52.6	55.4
Night-time										

[22] Application number D/2013/0081/F

[23] Application number D/2011/0043/F

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Cumulative Noise Limit, dB, $L_{A90,10min}$									
15 Reservoir Road	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
21 Reservoir Road	43.0	43.0	43.0	43.0	43.0	43.7	46.5	49.4	52.3	55.1
42 Reservoir Road	43.0	43.0	43.0	43.0	43.0	43.9	46.7	49.4	52.1	54.7

10.5 Embedded Mitigation

10.5.1 Construction Noise

88. During the Development's design phase, consideration was given to the turbine and energy storage positioning and layout to enable the existing infrastructure to be reused as far as practicable.

10.5.2 Operational Noise

89. During the Development's design phase, the turbine and energy storage layout was developed such that the distance from the turbines to noise-sensitive receptors was maximised as far as practicable.

90. Noise immission levels at surrounding receptors were considered at each of the main layout iterations and contributed to the development of the final layout.

10.6 Assessment of Potential Effects

10.6.1 Assessment Locations

91. The assessed receptors are identified in **Figure 10.2**. For each of these receptors, **Table 10.7** details the source of the respective background noise levels, from which the cumulative noise limits are derived.

Table 10.7: Assessed Receptors

Location Name	Source of Background Noise Data
15 Reservoir Road	15 Reservoir Road
21 Reservoir Road	21 Reservoir Road
42 Reservoir Road	42 Reservoir Road
97 Altnahinch Road	15 Reservoir Road
210 Corkey Road	15 Reservoir Road

10.6.2 Calculation of Apportioned Noise Limits

92. The cumulative developments included in this assessment are detailed in **Section 10.3.8.3**. When assessing cumulative noise levels, consideration should be given to any noise limits or other noise-related planning conditions applicable to each development.

93. Where there is no reasonable prospect of a cumulative development producing noise levels up to its consented (or proposed) limits, the GPG recommends that predicted noise levels should be used along with an additional safety margin. This approach prevents the sterilisation of an area in which existing wind turbine noise levels are substantially lower than the ETSU-R-97 limits, enabling further appropriate development to be considered. In such instances (i.e., Gruig and Altaveedan Wind Farms), an additional safety margin of 2 dB has been applied to the noise emissions of that development, on top of the required addition for uncertainty (typically a further 2 dB). Where this additional safety margin results in predicted noise levels greater than the applicable noise limit at a given wind speed, noise emission levels have been set such that the limit is just met at that wind speed.

94. In the case of the two single turbine developments, it was found that no specific noise limits had been stipulated. Instead, noise from the single turbine at 15 Reservoir Road (D/2011/0043/F) was controlled through a planning condition specifying the turbine type to be constructed, and the single turbine at 21 Reservoir Road (D/2013/0081/F) was controlled through a planning condition specifying the sound power levels of the specific turbine applied for. As such, no additional cumulative safety margin is required for these developments.

95. Details of the noise emission data for each cumulative development is presented in **Technical Appendix A10.2**, detailing the required adjustments in each instance.

96. **Table 10.8** details the predicted 'adjusted' cumulative noise levels (excluding noise due to the Development) for each of the assessed receptors identified in **Table 10.7**. It should be borne in mind that as the noise assessment follows GPG advice with regard to cumulative noise effects, the noise levels presented in **Table 10.8** are a theoretical worst case; a number of conservative assumptions have been made, as detailed in the previous sections of this chapter.

Table 10.8: Adjusted Predicted Cumulative Immission Levels

	Standardised 10 m Wind Speed, ms^{-1}									
Receptor	3	4	5	6	7	8	9	10	11	12
	Adjusted Cumulative Noise Level, dB, $L_{A90,10min}$									
15 Reservoir Road	37.8	40.9	41.4	41.8	42.3	42.6	43.0	43.3	43.6	43.9
21 Reservoir Road	31.9	34.2	35.0	35.9	36.5	37.2	37.7	37.9	38.1	38.2
42 Reservoir Road	30.8	33.3	34.2	35.1	35.7	36.3	36.8	37.0	37.2	37.3
97 Altnahinch Road	24.7	27.1	29.4	31.8	33.2	33.8	34.1	34.3	34.3	34.3
210 Corkey Road	25.8	29.5	31.6	33.4	34.1	34.6	35.1	35.4	35.4	35.4

10.6.3 Apportioned Noise Limits

97. As described in **Section 10.3.8.3**, the adjusted cumulative wind turbine noise levels (**Table 10.8**) have then been logarithmically subtracted from the total cumulative ETSU-R-97 noise limits (**Table 10.6**) to determine apportioned noise limits applicable to the Development in isolation. The daytime apportioned limits have then been corrected to ensure they do not exceed the limit for the Development in isolation of 35 dB $L_{A90,10min}$, or 5 dB above background, and take into account the non-financially involved status of 15 Reservoir Road with respect to the Development, as specified in **Section 10.3.8.1**.

98. The resulting apportioned limits applicable to the Development in isolation are presented in **Table 10.9**. These limits should be presented in the planning conditions of any planning consent given for the Development, to ensure the Development's compliance with ETSU-R-97 when considered both individually and cumulatively.

Table 10.9: Apportioned Noise Limits

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$									
Daytime										
15 Reservoir Road	35.0	35.0	35.0	35.5	37.0	39.0	40.7	40.1	39.3	42.7
21 Reservoir Road	35.0	33.8	33.7	38.4	41.9	44.8	47.6	50.2	52.8	55.3
42 Reservoir Road	35.0	34.6	33.8	37.8	41.2	44.1	47.0	49.7	52.5	55.3
97 Altnahinch Road	35.0	35.0	35.0	35.4	34.7	37.5	40.2	42.5	44.4	46.1
210 Corkey Road	35.0	35.0	35.0	34.5	33.9	37.1	40.0	42.3	44.2	46.0
Night-time										
15 Reservoir Road	43.0	42.8	42.5	42.1	41.7	41.3	40.7	40.1	39.3	38.4
21 Reservoir Road	42.6	42.4	42.2	42.1	41.9	42.5	45.9	49.1	52.1	55.0
42 Reservoir Road	42.7	42.5	42.4	42.2	42.1	43.1	46.2	49.1	51.9	54.7

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$									
97 Altnahinch Road	42.9	42.8	42.7	42.5	42.4	42.3	42.2	42.2	42.2	44.0
210 Corkey Road	42.9	42.9	42.8	42.7	42.5	42.4	42.4	42.4	42.4	44.1

10.6.4 Predicted Noise Levels due to the Development

99. **Table 10.10** details the predicted noise immission levels due to the operation of the Development, following the methodology described in **Section 10.3.8.2**, and using the noise emission data presented in **Section 10.3.5**.

Table 10.10: Predicted Operational Noise Levels due to the Development

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB, $L_{A90,10min}$									
15 Reservoir Road	24.0	26.7	30.9	34.6	36.8	37.0	37.0	37.0	37.0	37.0
21 Reservoir Road	26.2	28.8	33.0	36.8	38.9	39.1	39.1	39.1	39.1	39.1
42 Reservoir Road	24.1	26.8	31.0	34.7	36.9	37.1	37.1	37.1	37.1	37.1
97 Altnahinch Road	21.4	24.1	28.3	32.0	34.1	34.4	34.4	34.4	34.4	34.4
210 Corkey Road	20.9	23.6	27.8	31.5	33.7	33.9	33.9	33.9	33.9	33.9

100. **Table 10.11** details the difference (margin) between predicted noise immission levels (**Table 10.10**) and the apportioned noise limits (**Table 10.9**) for the assessed receptors. A negative margin indicates that the predicted noise level is below the derived noise limit.

Table 10.11: Margin Between Apportioned Noise Limits and Noise due to the Development

Receptor	Standardised 10 m Wind Speed, ms^{-1}									
	3	4	5	6	7	8	9	10	11	12
	Margin, dB									
Daytime										
15 Reservoir Road	-11.0	-8.3	-4.1	-0.9	-0.3	-2.0	-3.7	-3.1	-2.4	-5.7
21 Reservoir Road	-8.8	-4.9	-0.7	-1.6	-3.0	-5.7	-8.4	-11.1	-13.6	-16.1
42 Reservoir Road	-10.9	-7.8	-2.8	-3.1	-4.3	-7.0	-9.9	-12.6	-15.4	-18.2
97 Altnahinch Road	-13.6	-10.9	-6.7	-3.4	-0.6	-3.1	-5.9	-8.1	-10.0	-11.7
210 Corkey Road	-14.1	-11.4	-7.2	-3.0	-0.2	-3.2	-6.0	-8.3	-10.3	-12.1
Night-time										
15 Reservoir Road	-19.0	-16.2	-11.6	-7.5	-4.9	-4.3	-3.7	-3.1	-2.4	-1.4
21 Reservoir Road	-16.5	-13.5	-9.2	-5.3	-3.0	-3.4	-6.8	-10.0	-13.0	-15.9
42 Reservoir Road	-18.6	-15.7	-11.4	-7.5	-5.2	-6.0	-9.1	-12.0	-14.8	-17.6
97 Altnahinch Road	-21.6	-18.8	-14.5	-10.7	-8.4	-8.1	-8.0	-8.0	-8.0	-9.7
210 Corkey Road	-22.0	-19.2	-14.9	-11.0	-8.7	-8.4	-8.3	-8.3	-8.3	-10.1

101. As **Table 10.11** shows, worst-case noise levels due to the Development are below the apportioned limits applicable to the Development. Therefore, noise due to the Development has been shown to be compliant with the requirements of ETSU-R-97.

10.7 Mitigation and Residual Effects

10.7.1 Decommissioning/Construction Phase

102. The Development infrastructure has been located as far as practicable from residential dwellings in order to minimise the effect of noise during decommissioning/construction. The good practice measures detailed below will be implemented to manage the effects of noise during operations, and will be required of all contractors:

- Operations shall be limited to times agreed with CCGBC;
- Deliveries of turbine components, plant and materials by HGV to site shall only take place by designated routes and within times agreed with CCGBC;
- The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228;
- Where practicable, the work programme will be phased, which would help to reduce the combined effects arising from several noisy operations;
- Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens;
- All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions;
- Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night-time construction activities likely to generate significant noise levels, e.g., turbine erection; and
- Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g., generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, $L_{Aeq,night}$ shall not be exceeded at the nearest noise-sensitive receptors.

103. Application of the above measures to manage decommissioning/construction noise will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant legislation.

104. Should the Development require decommissioning, the level of noise produced is likely to be no greater than that during the initial decommissioning / construction phases. Any legislation, guidance or best practice relevant at the time of final decommissioning would be complied with.

10.7.2 Operational Phase

105. No mitigation beyond the embedded mitigation set out in **Section 10.5.2** is necessary to meet the requirements of guidance and avoid significant effects, and none is proposed.

10.8 Summary of Effects

106. An assessment of potential noise effects associated with the Development has been carried out.

107. Decommissioning/construction noise will be limited in duration and confined to working hours as specified by the CCGBC and therefore can be adequately controlled through the application of good practice measures and secured by planning condition. This will ensure that any noise from the Development site during construction will be adequately controlled.

108. Given the substantial (approximately 800 m) separation distance between the Energy Storage Unit and the closest noise-sensitive receptors, along with the low levels of noise likely to be emitted by the Energy Storage Unit, there is no reasonable prospect of a significant effect.

109. Wind Turbine Operational noise has been assessed in accordance with ETSU-R-97 and in line with current best practice. It has been shown that the Development would comply with the requirements of ETSU-R-97 at all receptor locations. The noise limits presented in **Table 10.9** are suitable for inclusion in any consent given for the Development, and will ensure the Development's compliance with ETSU-R-97 when considered both individually and cumulatively.

110. The cumulative effects of the Development in conjunction with nearby wind energy developments either operational, consented or the subject of a current planning application were taken into consideration in the above assessment, in accordance with ETSU-R-97 and the GPG.

10.9 Statement of Significance

111. Decommissioning/construction noise will be limited in duration and confined to working hours agreed with CCGBC, and can therefore be adequately controlled through planning condition. The application of mitigation measures where applicable will also ensure that any noise from site will be adequately controlled such that construction noise effects are **not significant**.

112. The effect of operational noise has been assessed using the methodology described in ETSU-R-97. Apportioned noise limits have been calculated for the relevant noise-sensitive properties, and predictions made based on the candidate turbine type. The predicted noise levels are calculated to be below the apportioned limits and therefore the effect of operational noise is **not significant**.

10.10 Glossary

113. **AGL:** Above Ground Level

114. **Background Noise:** The background noise level is the underlying level of noise present at a particular location for the majority (usually 90%) of a period of time. As such it excludes any short-duration noises, such as individual passing cars (but not continuous traffic), dogs barking or passers-by. Sources of background noise typically include such things as wind noise, traffic and continuously operating machinery (e.g. air conditioning or generators).

115. **Decibel (dB):** The decibel is the basic unit of noise measurement. It relates to the cyclical changes in air pressure created by the sound (Sound Pressure Level) and operates on a logarithmic scale, ranging upwards from 0 dB. 0 dB is equivalent to the normal threshold of human hearing at a frequency of 1000 Hz. Each increase of 3 dB on the scale represents a doubling in the Sound Pressure, and is typically the minimum noticeable change in sound level under normal listening conditions. For example, while an increase in noise level from 32 dB to 35 dB represents a doubling in sound pressure, this change would only just be noticeable to the majority of listeners.

116. **dB(A):** Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible frequencies. The ear is most sensitive in the middle range of frequencies (around 1000-3000 Hertz (Hz)), and less sensitive at lower and higher frequencies. The A-weighted noise level is derived by analysing the level of a sound at a range of frequencies and applying a specific correction factor for each frequency before calculating the overall level. In practice this is carried out automatically within noise measuring equipment by the use of electronic filters, which adjust the frequency response of the instrument to mimic that of the ear.

117. **Frequency:** The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the number of cycles (vibrations) per second.

118. **Noise Emission:** The sound power level emitted from a given source.

119. **Noise Immission:** The sound pressure level detected at a given location (e.g. nearest dwelling).

120. $L_{A90,t}$: This term is used to represent the A-weighted sound pressure level that is exceeded for 90% of a period of time, t. This is used as a measure of the background noise level.

121. **$L_{Aeq,t}$:** This term is known as the A-weighted equivalent continuous sound pressure level for a period of time, t. It is similar to an average, and represents the sound pressure level of a steady, continuous noise which has the same energy as the actual measured noise.

122. **Low-frequency noise:** Noise at the lower end of the range of audible frequencies (20 Hz – 20 kHz). Usually refers to noise below 250 Hz. Should not be confused with infrasound, which is sound below the lowest normally audible frequency, 20 Hz.

123. **Noise:** Unwanted sound. May refer to both natural (e.g. wind, birdsong etc.) and artificial sounds (e.g. traffic, noise from wind turbines, etc.).

124. **Noise-sensitive receptors:** Locations that may potentially be adversely affected by the addition of a new source of noise (typically residential dwellings).

125. **Sound power (W):** The sound energy radiated per unit time by a sound source, measured in watts (W).

126. **Sound power level (L_w):** Sound power measured on the decibel scale, relative to a reference value (Wo) of 10^{-12} W.

127. **Sound pressure (P):** The fluctuations in atmospheric pressure relative to atmospheric pressure, measured in Pascals (Pa).

128. **Sound pressure level (L_p):** Sound pressure measured on the decibel scale, relative to a sound pressure of 2×10^{-5} Pa.

129. **Tonal element:** A characteristic of a sound where the sound pressure level in a particular frequency range is greater than in those frequency ranges immediately above higher or lower. This would be perceived as a humming or whining sound.

130. **Vibration:** In this context, refers to vibration carried in structures such as the ground or buildings, rather than airborne noise.

11 Archaeology and Cultural Heritage

11.1 Introduction

1. This chapter of the Environmental Statement (ES) evaluates the effects of the Development on the archaeology and cultural heritage resource. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus). The assessment will consider the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of the Operational Corkey Windfarm (Initial Phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

2. The decommissioning of the Operational Corkey Windfarm and the construction of the Development are likely to occur partly in tandem. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the decommissioning of the Development is considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

3. This Chapter of the ES is supported by the following Technical Appendix provided in **Volume 3 Technical Appendices**:

- Technical Appendix A11.1: Archaeological Desk-Based Assessment.

4. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

5. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

11.2 Legislation, Policy and Guidance

6. This section sets out guidance, legislation and information sources that have been considered in carrying out this assessment.

7. Statutory protection for archaeology is principally outlined in:

- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995)[1]; and
- The Planning (Listed Buildings) Regulations (Northern Ireland) 2015[2], as amended.

8. The assessment was undertaken using planning guidelines set out in the:

- Planning Policy Statement 6 (PPS 6): Planning, Archaeology and Built Heritage (March 1999)[3];
- Strategic Planning Policy Statement for Northern Ireland (SPPS) (September 2015)[4];
- The Northern Area Plan 2016 (NAP 2016)[5]; and
- The emerging Causeway Coast and Glens Borough Council Local Development Plan 2030[6].

9. Several government and professional organisations have established guidelines relevant to assessing development impacts on archaeology and cultural heritage which are considered best practice. These include:

- ICOMOS guidance on heritage impact assessments[7];
- Standards and Guidance for Archaeological Desk-Based Assessments provided by the Chartered Institute for Archaeologists (CIfA)[8]; and
- Department for Communities' Guidance on Setting[9].

10. These are discussed further in **Chapter 5: Planning** of this ES and within the Planning Statement submitted separately as part of the application.

11.3 Assessment Methodology and Significance Criteria

11.3.1 Scoping Responses and Consultations

11. Consultation for this ES topic was undertaken with the organisations shown in **Table 11.1**. **Chapter 2: EIA Methodology** of this ES summarises the Scoping process and responses and sets out the aspects that were agreed to be excluded from the scope of the EIA.

Table 11.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Historic Environment Division of Department for Communities	Scoping Response 29/09/17	An assessment of effect upon archaeological resources is required. There are a number of archaeological sites within the environs dating to the Bronze Age and Medieval Period with one site within the Development boundary. Consideration should be given to Scheduled and State Care sites beyond 5km. A comprehensive cumulative assessment is required.	The archaeological baseline is presented in **Technical Appendix A11.1**, Archaeological Desk-Based Assessment. **Section11.5** of this ES considers any potential significant effects on archaeological resources within the site, and designated heritage assets out to 5 km. As no significant effects were identified on scheduled monuments within 5 km, it was deemed that scheduled monuments beyond 5 km are unlikely to receive a significant effect and are therefore not considered further. Only one heritage asset within state care and the ZTV beyond 5 km is included in the assessment in **Section 11.5 –** see **11.3.1.2** for reasoning. A cumulative assessment is provided in **Section 11.7** of this ES.

11.3.1 Study Area

12. The study areas used to support the assessment are set out below in **Table 11.2**.

[1] Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995. Available at http://www.legislation.gov.uk/nisi/1995/1625/contents/made [Accessed 17/05/2019]
[2] The Planning (Listed Bridlings) Regulations (Northern Ireland) 2015. Available at http://www.legislation.gov.uk/nisr/2015/108/contents/made [Accessed 17/5/2019]
[3] Department of the Environment Northern Ireland (March 1999) Planning Policy Statement 6 (PPS 6): Planning, Archaeology and Built Heritage. Available at https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/pps06-archaeology-built-heritage.pdf [Accessed 17/05/2019]
[4] Department of the Environment Northern Ireland (September 2015) •Strategic Planning Policy Statement for Northern Ireland (SPPS). Available at https://www.planningni.gov.uk/index/policy/spps_28_september_2015-3.pdf [Accessed 17/05/2019]
[5] Department of the Environment (September 2015) The Northern Area Plan 2016 (NAP 2016). Available at https://www.planningni.gov.uk/northern_2016.htm [Accessed 17/05/2019]
[6] Causeway Coast and Glens Borough Council (on-going). Development Plan. https://www.causewaycoastandglens.gov.uk/live/planning/development-plan [Accessed 17/05/2019]
[7] ICOMOS (2011) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties
[8] CIFA (Dec 2014, updated Jan 2017) Standards and Guidance for Archaeological Desk-Based Assessments. Available at https://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_3.pdf [Accessed 17/05/2019]
[9] Department for Communities (2018) Guidance on Setting and the Historic Environment

Table 11.2: Definition of Archaeology and Cultural Heritage Study Areas

Effect	Name	Range	Description	Figure
Direct	Core Study Area	Site Boundary at time of Scoping	Area within which the Development may have direct effects upon known and unknown archaeological remains. Further information is provided in **Section 11.3.1.1**.	11.1
Direct	1 km Study Area	1 km radius surrounding the Core Study Area	Area used to ensure a full understanding of the archaeological resource and so the potential for unknown archaeology to survive within the Core Study Area. Further information is provided in **Section 11.3.1.1**	11.1
Indirect	5 km Study Area	5 km surrounding the Core Study Area	Area within which the Development has potential to cause likely significant indirect (visual) effects upon heritage assets as a result of changes in their setting and hence requiring detailed assessment. Further information is provided in **Section 11.3.1.2**	11.2
Cumulative	Cumulative Study Area	10 km surrounding the Core Study Area	Only windfarm developments (subject to a valid planning application, consented, under construction or operational windfarms) within 10 km of the Development are considered likely to give rise to a cumulative effect. Significant effects are most likely to occur within 5 km of a windfarm development (i.e. where cultural heritage features lie within the overlapping 5 km ranges where significant effects are most likely associated with a specific windfarm). Further information is provided in **Section 11.3.6**.	6.12

11.3.1.1 Direct Effects

13. The study areas used to support the assessment are set out in **Table 11.2** and are shown on **Figure 11.1** and **Figure 11.2**. The 'Core Study Area' as referred to in the Desk-Based Assessment is equivalent to the area contained within the Site Boundary as defined at scoping and covers an area of 312 hectares (ha). The archaeological '1 km Study Area' includes the Core Study Area and land within a 1 km radius. Data was collected within the Core Study Area and 1 km Study Area to inform the potential for direct effects on known and unknown archaeology. The 1 km Study Area covers an area significantly larger than the Core Study Area in order to ensure a full understanding of the archaeological resource including the potential and type of unknown subsurface archaeology that may survive within the Core Study Area.

11.3.1.2 Indirect Effects

14. For the assessment of indirect effects on Designated Heritage Assets, data was initially collected on all designated heritage assets within 15 km. Following consultation, a review of the data obtained and the ZTV, and in conjunction with site visits and professional judgement, only heritage assets located within the 5 km Study Area (as shown on **Figure 11.2**) were deemed to have the potential to receive a significant effect as a result of changes to their setting. It was therefore deemed that these assets required further detailed assessment in line with the EIA Regulations.

15. One designated heritage asset beyond the 5 km Study Area is also included in the further assessment, as highlighted in **Figure 11.3**. Based on its location, its status as a promoted site, and consultation responses from the Historic Environment Division of the Department of Communities, it was deemed to require further assessment.

11.3.2 Scope of Assessment

16. The key issues for the assessment of potential cultural heritage effects relating to the Development are:

- Temporary, reversible effects arising from the initial decommissioning and construction phases of the Development, such as noise, signage and higher vehicular and pedestrian activity which may cause reduced access to and / or reduced visibility and appreciation of the historical environment;
- Permanent, direct effects to archaeological features due to damage or destruction as a result of land take by the foundations, access tracks and other infrastructure; and
- Indirect effects, including visual effects, on cultural heritage assets as a result of changes to their setting, which may adversely affect such assets. Such visual effects are likely to occur as a consequence of the presence, size and scale of the Development in the landscape. This is likely to impact on cultural heritage assets located on higher ground where their historical significance lies in their wider landscape setting including long views to and from the asset. Examples of these types of assets are raths and forts. These effects would be reversible in the event that Development is decommissioned (Final decommissioning phase).

11.3.3 Design Parameters

17. No additional design parameters, other than those set out in **Chapter 3: Development Description** and **Chapter 4: Site Selection and Design** of this ES, are required for the assessment presented in this Chapter.

18. As set out in **Chapter 3: Development Description**, the possibility of micro-siting within 50 m (in all directions) of the Development footprint, where constraints allow, may be utilised to avoid any further unknown or unrecorded onsite environmental or technical constraints uncovered at the time of decommissioning/construction. Consideration has been given to the micro-siting tolerances specified, and this would not affect any concluding statements of significance arrived at as part of this assessment. Micro-siting allowances can minimise effects upon unknown archaeological deposits of significance should they be encountered during decommissioning and construction activities as this allows for the ability to relocate infrastructure for avoidance.

11.3.4 Baseline Survey Methodology

19. A Desk-Based Assessment (DBA) was undertaken using available documentary, cartographic and photographic evidence to inform the baseline, based on the Core Study Area and 1 km Study Area outlined in **Section 11.3.1** above. The DBA is provided in **Technical Appendix A11.1**. The DBA has been based on readily available and relevant documentary sources. The following archives were consulted:

- Databases of archaeology and cultural heritage assets maintained by Department for the Communities[10];
- Cartographic Evidence as held by the Public Record Office of Northern Ireland (PRONI)[11]; and
- Contemporary Aerial Photography, as held by PRONI[12].

20. Site visits were undertaken in December 2018, to validate the historic environment record of the area and to identify and (where possible) record any previously unrecorded cultural heritage features within the Core Study Area and 1 km Study Area. Site visits to heritage assets within the 5 km Study Area were also conducted, along with other heritage assets assessed within this chapter.

21. Information on heritage assets within the 5 km Study Area and 10 km Cumulative Study Area was also obtained from the same archive sources listed above and is reported in **Section 11.4.4** and **Section 11.7.**

11.3.5 Methodology for the Assessment of Effects

22. The assessment of effects is based on the final design of the Development. In line with ICOMOS guidance[13], the assessment of effects upon heritage assets is undertaken by establishing the asset's significance and how that significance could be changed as a result of the Development. In order to do this, the appraisal starts with a consideration of the sensitivity of a

[10] Historic Environment Digital Datasets. Available at https://www.communities-ni.gov.uk/publications/historic-environment-digital-datasets
[11] PRONI Historical Maps Viewer. Available at https://www.nidirect.gov.uk/information-and-services/search-archives-online/proni-historical-maps-viewer
[12] Ibid
[13] ICOMOS (2011) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties

cultural heritage asset against the magnitude of any potential change, to arrive at the significance of the effect, as informed by professional judgement.

11.3.5.1 Sensitivity of Receptors

23. The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Development or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

24. As a starting point, the sensitivity of the cultural heritage assets / receptors has been equated with designated status, as shown in **Table 11.3**; however, the final level of sensitivity is based upon each heritage asset's individual characteristics with as determined by professional judgement.

25. Listed Buildings are designated, subject to grading (Category A, B+ and B) and placed on a list that is maintained by the Department for Communities. For the purposes of this assessment the categorisation of each Listed Building has been used as the starting point to define the level of sensitivity.

Table 11.3: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	World Heritage Sites - these are internationally important.
High	Scheduled Historic Monuments, State Care Monuments, Category A Listed Buildings, Historic Parks, Gardens and Demesnes – these are considered to be nationally important.
Medium	Category B+ Listed Buildings, regionally important archaeological features and areas (as defined in the Sites and Monuments Record (SMR)), and Conservation Areas – these are considered to be regionally important.
Low	Category B (B1/B2) Listed Buildings, locally important sites and archaeological features (as defined in the SMR) – these are considered to be locally important.
Negligible	Badly preserved and/ or damaged or very common archaeological features and buildings of little or no value at local or any other scale.

11.3.5.2 Magnitude of Effect

26. The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect, and with regard to professional judgement, as informed by best practice guidance and legislation.

27. Magnitude is the measure of change as a result of the expected effect of the Development. It has been classified, for both direct and indirect effects, as shown in **Table 11.4**. For the purpose of assessing indirect effects, an assets proximity to the Development and presence within the ZTV, combined with the specific attributes or interests of an asset (e.g. whether the importance of an asset is derived from its long uninterrupted views and positioning within a largely unchanged landscape) have been taken as two attributes in the determination of magnitude.

Table 11.4: Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
Very High	Total loss of or major alteration to a site, building or other feature (e.g. destruction of archaeological feature). Blocking or severance of a key visual or other relationship.
High	Major damage to or significant alteration to a site, building or other feature. Extensive change to the setting of a feature (e.g. loss of dominance, intrusion on key view or sightline).
Medium	Damage or alteration to a site, building or other feature. Encroachment on an area considered to have a high archaeological potential for buried remains. Change in the setting of a feature (e.g. intrusion on designed sight-lines and vistas).
Low	Minor damage or alteration to a site, building or other feature. Encroachment on an area where it is considered there is low potential for buried archaeological remains to exist. Minor change in the setting of a feature (e.g. above historic skylines or in designed vistas).
Negligible	No physical impact. Slight change in setting.

28. If no change is predicted as a result of the Development, this is stated in the assessment as no effect.

11.3.5.3 Significance of Effect

29. The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. **Table 11.5** summarises guideline criteria for assessing the significance of effects.

Table 11.5 Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
Very High	Major	Major	Moderate	Moderate	Minor
High	Major	Major	Moderate	Minor	Negligible
Medium	Moderate	Moderate	Moderate	Minor	Negligible
Low	Moderate/Minor	Minor	Minor	Negligible	Negligible
Minor	Minor	Negligible	Negligible	Negligible	Negligible

30. Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations, and are shaded in green in the above table. Where potential scores of moderate or major significance have been predicted for features using the matrix-based approach shown in **Table 11.5** such features have been selected for a more detailed consideration in **Section 11.5.** This section defines the heritage asset and any contributions of setting to their cultural significance with consideration for its designation status, essential attributes, etc. An assessment is made using professional judgement of the extent to which changes in the setting as a result the Development affect the heritage asset and an assessment of significance of the effect is given. Potential effects that are assessed as minor or negligible are not significant in terms of the EIA Regulations.

31. The assessment has taken an approach in which the designation status (sensitivity) of a feature is set against the magnitude of the effect of the Development. For the purposes of assessing indirect effects, distance from the asset to the Development is considered a determinant in the degree of magnitude of any change that might be caused. Simple intervisibility with the Development is not necessarily considered to be harmful, unless it is clear that this negatively affects the integrity of the heritage asset and its relationship with its wider landscape setting (where this has been identified as a key attribute of its setting/listing).Where relevant, consideration has therefore been given to the effect that the Development will have on changes to the settings of heritage assets in views towards/across the asset which include the Development, as well as in views towards the Development from the asset. Distances given, are always from the nearest proposed turbine.

32. It is also important to consider that forestry and woodlands, as well as buildings, within landform can provide visual screening to cultural heritage features. However, it is noted that in managed forests the level of screening will alter and views which previously did not exist, may be opened up over time.

11.3.6 Assessment of Cumulative Effects

33. A cumulative effect is an additional effect which arises from the Development in combination with other effects caused by other existing, consented or proposed developments on a given cultural heritage resource. Based upon the scale of the Development and professional judgement and experience, heritage assets that lie at a distance greater than 5 km from a

given windfarm are considered unlikely to receive a significant effect; significant effects are considered most likely within 5 km of any windfarm when assessed in isolation. For the purposes of the assessment of cumulative effects, only windfarm developments (subject to a valid planning application, consented, under construction or existing operational windfarms) within 10 km of the Development have been initially considered (i.e. where cultural heritage features lie within the overlapping 5 km ranges where significant effects are most likely associated with a specific windfarm). The potential for a significant cumulative effect is considered likely to occur within the 5 km zone where the ZTVs for each windfarm development, included in the cumulative effect assessment, would overlap within this range; i.e. where each is theoretically simultaneously visible. The windfarms within this Cumulative Study Area have then been further considered. Heritage assets where there is potential for a significant cumulative effect are assessed further within the cumulative assessment of this ES.

34. Further details on cumulative development selection can be found in **Chapter 6: Landscape and Visual Impact Assessment** of this ES. Locations of cumulative development sites considered as part of the landscape cumulative assessment are listed in **Technical Appendix 2.3** and shown in **Figure 6.12**, and those that are relevant to the Cultural Heritage assessment are listed in **Table 11.6**. As with the Landscape and Visual Impact Assessment, developments in Scoping have not been considered as detailed in **Chapter 6: Landscape and Visual Impact Assessment, Section 6.5.6** of this ES.

35. The selection of cumulative sites focused on larger wind developments (i.e. with more than 2 turbines and heights greater than 100 m as detailed in **Technical Appendix 2.3**) within the 10 km Cumulative Study Area. Those considered relevant to the heritage cumulative assessment are listed in **Table 11.6**. Consideration was also given to single turbines within 5 km of the Development. These are detailed in **Table 11.6** and shown in **Figure 6.12**. In this assessment, windfarms that are operational or under construction are considered as 'baseline' windfarms and considered further as part of the main assessment as identified in **Table 11.6**. There is less certainty that consented and application stage windfarms will be constructed, and these are therefore included within the cumulative assessment rather than as part of the baseline as identified in **Table 11.6**.

Table 11.6: Cumulative Developments within 10 km included in Heritage Cumulative Assessment

Windfarm Developments (2+ turbines, >100m height, within 10 km)	Summary	Approximate Distance from Development Turbines
Operational Corkey Windfarm	Operational - 10 Turbines Scheme which the Development would replace.	N/A
Gruig Windfarm	Operational - 10 turbine scheme located adjacent to south of the Development, 100 m to tip.	800 m SE
Altaveedan Windfarm	Operational - 9 turbine scheme, 101 m to tip	3.9 km N
Armoy Windfarm	Application – 6 turbine scheme, 149.9 m to tip	8.7 km N

Single Turbines within 5 km	Summary	Approximate Distance from Development Turbines
Coolkeeran Road (134))	Operational – 2 turbines, 34.2 m to tip	4.9 km NW
Corkey Road (145/1)	Operational – 1 turbine, 35 m to tip	2.8 km W
Corkey Road (163)	Operational – 1 turbine, 35 m to tip	2.3 km W
Corkey Road (99)	Operational – 1 turbine, 35 m to tip	2.6 km NW
Gruig Land (15)	Operational – 1 turbine, 43.5 to tip	2.1 km SW
Loughgiel Community Asset	Operational – 1 turbine, tip height unknown	4.2 km NW
Moneyduff Road (46)	Operational – 1 turbine, 35 m to tip	4.3 km SW
Omerbane Road (24)	Operational – 1 turbine, 35 m to tip	3.5 km S
Omerbane Road (31)	Operational – 1 turbine, 54.5 m to tip	3.5 km S
Omerbane Road (29)	Operational – 1 turbine, 43.5 m to tip	4.2 km S
Reservoir Road (21)	Operational – 1 turbine, 67 m to tip	0.4 km N
Reservoir Road (15)	Operational – 1 turbine, 48 m to tip	0.8 km N
Shelton Road	Operational – 1 turbine, 24.5 m to tip	3.5 km NW
Ballyveely Road (96)	Consented – 1 turbine, 47.5 m to tip	4.5 km NW
Corkey Road (18)	Consented – 1 turbine, 34.2 m to tip	2.9 km NW
Corkey Road (8)	Consented – 1 turbine, 43.5 m to tip	3.3 km NW
Corkey Rod (108)	Consented – 1 turbine, 45.6 m to tip	2.0 km NW
Corkey Road (237)	Consented – 1 turbine, 47 m to tip	2.7 km NW
Corkey Ext	Consented – 1 turbine, 100 m to tip	1.0 km NW
Corkey Road (145/2)	Consented – 1 turbine, 66 m to tip	2.8 km NW
Gruig Lane (12)	Consented – 1 turbine, 55 m to tip	2.4 km SW
Loughill Road (48)	Consented – 1 turbine, tip height unknown	4.9 km SW
Moneyduff Road (35)	Consented – 1 turbine, 60.7 m to tip	4.8 km SW
Tullykittagh Road 1	Consented – 1 turbine, 55.7 m to tip	3.5 km SW
Tullykittagh Road 2	Consented – 1 turbine, 55 m to tip	3.3 km SW
Ballyveeely Road (99)	Application – 1 turbine, 52 m to tip	3.2 km NW

11.3.7 Assessment Limitations

36. No gaps in knowledge have been identified. It should be noted that the assessment undertaken is based upon a desk-based assessment aided by site walkovers and visits to heritage assets. No intrusive survey has been carried out.

11.3.8 Embedded Mitigation

37. The design of the layout has sought to avoid any known archaeological features within the Core Study Area; therefore, avoiding any direct impacts and securing preservation *in situ*.

11.4 Baseline Description

11.4.1 Desk-Based Assessment - Core Study Area

38. The Core Study Area is located approximately 18 km north of Ballymena in County Antrim and includes the Operational Corkey Windfarm. It is located on the western periphery of the Antrim Hills with the low-lying valley of the River Main to the west and the broader range of the Antrim Hills to the east. It is characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan and its moorland land cover. The predominant land use, in conjunction with the Operational Corkey Windfarm, is agricultural with rough grazing on the slopes of the hill. Elevations within the Core Study Area (shown in **Figure 11.1**) range from approximately 160 m AOD in the south-west to approximately 410 m AOD in the east.

39. There are 12 cultural heritage assets within or partially within the Core Study Area. None of these are designated heritage assets. They are listed in **Table 11.7** and shown in **Figure 11.1.**

Table 11.7: Heritage Features within the Core Study Area

Reference Number	DBA Site ID	Name	Period
ANT 23:08	1	Kill Old Graveyard	Uncertain
Historic Mapping	9	Sheepfold	Post-Medieval
Historic Mapping	10	Possible enclosure or sheepfold	Post-Medieval
Historic Mapping	11	Possible enclosure or sheepfold	Post-Medieval
Historic Mapping	12	Possible agricultural buildings or enclosure on either side of track	Post-Medieval
Historic Mapping	13	Possible agricultural buildings or enclosure on either side of track	Post-Medieval
Historic Mapping	14	Enclosure	Post-Medieval
Historic Mapping	15	Sluice	Post-Medieval
Historic Mapping	16	Possible enclosure	Post-Medieval
Historic Mapping	17	Possible enclosure and field system	Post-Medieval
Historic Mapping	18	Sheepfold	Post-Medieval
Historic Mapping	19	Possible enclosures or buildings	Post-Medieval

11.4.2 Desk- Based Assessment - 1 km Study Area

40. The majority of the 1 km Study Area is in use as pastoral farmland with scattered housing along the roadways to the west. There are 19 heritage features located within this 1 km Study Area, which includes the 12 within the Core Study Area. There are no Listed Buildings, Scheduled Monuments, Historic Parks and Gardens and Demesnes, Conservation Areas or World Heritage Sites within the 1 km Study Area. Further details are found in **Technical Appendix A11.1**.

11.4.3 Archaeological Potential

41. The archaeological potential of the Core Study Area is considered to be low due to its exposed upland, moorland nature and previous impacts associated with the construction of the Operational Corkey Wind Farm. Any remains within the Core Study Area are considered most likely to date to the post-medieval period though earlier, isolated find spots may occur. Further details are found in **Technical Appendix A11.1**.

11.4.4 Designated Heritage Assets within the 5 km Study Area

42. There are a total of 11 Scheduled Monuments, 18 Listed Buildings (of all categories) and one Historic Park, Garden and Demesne within the 5 km Study Area, which extends from the Core Study Area boundary and not the nearest turbines, hence some heritage assets selected for assessment are beyond 5 km from the nearest turbine. These are illustrated in **Figure 11.2.** There are no World Heritage Sites or Conservation Areas within the 5 km Study Area.

43. These heritage assets have the potential to be subject to a significant effect as a result of the Development. These have been summarised below (**Table 11.1** and **Table 11.2**) and are subject to a detailed assessment as part of this ES.

44. In addition to these assets, Dooey's Cairn (ANT022:012), a monument in state care, has been included within the assessment as requested by Historic Environment Division of Department for Communities. This asset is included in **Table 11.1**.

11.4.4.1 Scheduled Monuments

45. There are 12 Scheduled Monuments within the 5 km Study Area. Ten of which are situated within the ZTV in whole or part, and as such have the potential to receive a significant effect upon their settings.

46. Based on comments received during consultation, one asset located beyond the 5km Study Area has been included in this assessment and is detailed in **Table 11.1**. These assets are discussed in **Section 11.5.**

Table 11.1: Scheduled Monuments within the 5 km Study Area, including Additional Assets identified during Consultation

Index Number	Scheduled Monument	Approximate Distance and Direction from the Core Study Area Boundary
ANT 018:006	Raised Rath	4.1 km north-west
ANT 018:015	Standing Stone	1.8 km north-west
ANT 018:019	Motte and Bailey and Two Urn Burials, Possible Rath	4.5 km west north-west
ANT 018: 046	Cross-Carved Stone	5.1 km north-west
ANT 018:085	Standing Stone	2.0 km north-west
ANT 018:088	Standing Stone	3.1 km north-west
ANT 018:095	Standing Stone	1.8 km north-west
ANT 023:004	Kill Old Graveyard and possible enclosure	4.6 km west
ANT 023:005	Raised Rath: Killagan Fort	4.8 km west; not within ZTV
ANT 023:007	Raised Rath	1.4 west
ANT 023:015	Island, Possible Crannog	2.7 km south-west
ANT 19:001/19:002	Barrows or Cairns: Hugh McPhelim O'Neill Tomb	4.9 km north-west; not within ZTV
ANT 022:012	Dooey's Cairn Court Tomb	9.4 km south-west

11.4.4.2 Listed Buildings

47. There are 18 Category B (B1/B2) Listed Buildings within the 5 km Study Area; all of which lie within the ZTV. There are no Category A or Category B+ Listed Buildings within the 5 km Study Area. They are listed in **Table 11.9** and are assessed and discussed in **Section 11.5**.

Table 11.9: Listed Buildings within the 5km Study Area, and those requested during consultation

HB Number	Listed Building Address	Designation	Approximate Distance and Direction from Core Study Area Boundary
HB04/05/002	2 Corkey Road Loughguile Ballymoney Co.Antrim	B1	2.9 km north-west
HB04/05/004	121 Corkey Road Corkey Ballymena Co.Antrim	B1	1.5 km north-west
HB04/07/001	All Saints Church Ballyveely Road Castlequarter Ballymoney Co.Antrim	B	3.5 km north-west
HB04/07/002	Lissanoure Cottage 11 Knockahollet Road Castlequarter Ballymoney Co.Antrim	B	3.4 km north-west
HB04/07/004	Killagan Bridge Drumadarragh/Drumavaddy Dunloy Ballymena Co.Antrim	B2	4.6 km west
HB04/07/005	Killagan Cottage 49 Ballinaloob Road Dunloy Ballymena Co.Antrim	B1	4.0 km south-west
HB04/07/008	Checker Hall 51 Ballyweeny Road Ballyweeny Corkey Ballymena Co.Antrim	B2	1.8 km west
HB04/07/009	Conservatory and Garden House Lissanoure Castlequarter Ballymoney Co.Antrim	B	3.4 km north-west
HB04/07/010	The Stables and Old Castle Lissanoure Castlequarter Ballymoney Co.Antrim	B1	3.7 km north-west
HB04/07/011	The Gate Lodge Lissanoure 9 Knockahollet Road Castlequarter Ballymoney Co.Antrim	B	3.1 km north-west
HB04/07/012	Gazebo Lissanoure Castlequarter Ballymoney Co.Antrim	B	3.9 km north-west
HB04/07/013	The Old Church (ruins) Lissanoure Castlequarter Ballymoney Co.Antrim	B	3.2 km north-west
HB04/07/014	Rectory 74 Ballyveely Road Castlequarter Ballymoney Co.Antrim	B1	3.1 km north-west
HB04/07/015	82 Ballyveely Road Cloughmills Ballymoney Co.Antrim	Record Only	5.0 km south-east
HB04/16/001	RC Church of the Sacred Heart Culcrum Road Cloughmills Co.Antrim	B	3.6 km south-west
HB04/16/002	Killagan Parish Church 51 Drumadoon Road Drumadoon Cloughmills Co.Antrim	B	4.1 km south-west
HB04/16/006	Drumadoon House 236 Frocess Road Cloughmills Co.Antrim	B2	4.7 km south-west
HB07/01/016	Beetling Mill and Component Parts Tullykittagh Road Cloughmills Co.Antrim	B1	1.8 km south south-west

11.4.4.3 Registered Parks and Gardens within the 5 km Study Area

48. There is one Registered Historic Park and Garden within the 5 km Study Area. This is Lissanoure (AN=049) located approximately 2.6 km north-west of the Core Study Area.

11.5 Assessment of Potential Effects

11.5.1 Potential Construction Effects

11.5.1.1 Direct Effects

49. The layout of the Development has been designed to avoid known heritage features including those identified in the Desk-Based Assessment (**Technical Appendix 11.1**). As such, known archaeological remains have been avoided and will not receive any direct effect as a result of the Development. As locally important sites and archaeological features of low sensitivity with no physical effect, the effect is assessed as negligible and not significant in terms of the EIA Regulations.

50. Although there is low potential for archaeological remains to be situated within the Core Study Area, potential direct effects as a result of the initial decommissioning/construction phases of the Development may occur on unknown archaeological

remains, should extant subsurface remains survive within the Development footprint. If direct effects were to occur on unknown archaeological remains, it would result in the permanent damage or destruction of the feature.

51. Any such remains, if present, are likely to relate to past pastoral and transhumance use of the land, and likely to be of low sensitivity. Due to the relatively limited footprint of the Development, with focus on the utilisation of existing infrastructure linked to the Operational Corkey Windfarm, the likelihood of damage occurring is limited.

52. If direct effects were to occur, the effects would be of a potentially high magnitude (major damage). The Development has the potential therefore to cause an effect of very high magnitude on an asset of low sensitivity. The potential effect is therefore assessed as at most, minor and not significant in terms of the EIA Regulations.

53. If necessary, any limited direct effect resulting from the Development can be further mitigated by the implementation of a programme of archaeological evaluation, likely to consist of a targeted watching brief in undisturbed portions of the Site, leading to preservation by record.

11.5.1.2 Indirect Effects

54. Indirect visual effects are considered likely during the initial decommissioning and construction phases of the Development (see **Chapter 3: Development Description** for further details). They will occur in the form of the visual appearance of cranes during turbine dismantling and erection and associated traffic activities. These effects are short term and will cease once the Development has been constructed. These effects are similar in nature to the indirect effects likely to occur during the operational phase of the Development. Indirect effects on the settings of cultural heritage features resultant from the operational phase are discussed fully in **Section 11.5.2.2** below.

11.5.2 Potential Operational Phase Effects

11.5.2.1 Direct Effects

55. No direct effects will occur on any cultural heritage assets during the operational phase of the Development, as there will be no new land-take beyond those areas considered during the initial decommissioning/construction phases.

11.5.2.2 Indirect Effects

56. The assessment of indirect effects has considered designated and regionally significant cultural heritage assets within the 5 km Study Area, and any additional heritage assets highlighted during consultation which fall outwith this 5 km Study Area.

11.5.2.3 Historic Parks, Gardens and Demesnes within the 5 km Study Area

57. There is one park and garden within the 5 km Study Area. Lissanoure (AN-049) lies 3.8 km north-west of Turbine 3 (T3), as shown in **Figure 11.2**. The designation boundary surrounds the estate which was focused around a 14th century castle that was succeeded by later houses. The landscape park incorporates a lake, farmland, shelterbelts and woodland which limits the setting to the designation boundary. Key views are restricted to within the designation boundary and do not include long-distance views to the surrounding landscape due to screening provided by woodland. As such, the Development remains largely screened from within the grounds of the estate. There may be intermittent visibility of the Development in glimpsed views of the hills to the east from the eastern estate boundary; however, this upland landscape context is characterised by existing windfarm sites with the Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm visible as well as the single turbines along Corkey Road, Reservoir Road and Gruig Lane. The Development would replace the Operational Corkey Windfarm and would be seen in the context of the adjacent operational Gruig Windfarm to the south and Altaveedan to the north. Whilst the Development would consist of taller turbines, it would be seen within the distant upland context in which turbines are already sited. As such, the change in landscape context to the east of the park would be slight, consisting of taller turbines visible above a ridgeline in views that already contain other wind turbines, which would not alter the significance or character of the park or the ability to understand, experience, or enjoy it. As such, this constitutes a negligible magnitude of change. As a park and garden are of high sensitivity, with a negligible magnitude of change, the effect is assessed as negligible which is not significant in terms of the EIA Regulations.

11.5.2.4 Scheduled Monuments within the 5 km Study Area

58. There are 12 Scheduled Monuments within the 5 km Study Area, ten of which fall within the ZTV as shown on **Figure 11.2**. Where appropriate, these have been assessed in groups, as detailed in the relevant sections below.

59.

– ANT 018:006

60. ANT 018:006 is a small circular raised rath located 4.8 km north-west of T3 in the townland of Ballyknock Big, as shown in **Figure 11.2**. The raised rath is situated on a west-facing slope with good views to the west which define its setting. Whilst the turbines are theoretically visible from the rath, the location of the Development, 4.8 km to the south-east, means that there will be no effect on the setting of the asset and key views from it to the west remain unchanged.

61. The Development would be located within a distant upland landscape context to the east that is characterised by existing windfarm sites. The turbines would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines along Corkey Road and Reservoir Road forming part of the lower rolling topography agricultural land between the rath and the Site. As such, the change in the wider landscape context, in views which are not important to the assets setting, would be slight, consisting of intermittent tips above a distant ridgeline in which turbines are already sited. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

62. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 018-015, ANT A018:085, and ANT 018:095

63. ANT 018:015 is a standing stone located 2.7 km north-west of T3 in the townland of Corkey North, as shown in **Figure 11.2**. It stands in a modern field boundary overlooking another standing stone (ANT 018:095) approximately 100 m to the west. Another standing stone (ANT018:085) is located approximately 225 m to the north. The stones are located on west-facing slopes within improved grassland. There are good views in all direction except to the west.

64. The wider landscape setting of the stones includes the field and surrounding farmland in which they are situated, and from where they are best visually appreciated and their relationship to each other is evident. The views to the north, south and east across rolling agricultural landscape contribute to the understanding and appreciation of the assets and their relationship to each other, and so form part of its wider setting.

65. The Development is not within the immediate setting, but located to the south beyond the rolling agricultural topography and within a separate upland landscape context that is characterised by existing windfarm sites so that there is no change to the current setting of the standing stones. The proposed turbines would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to its south. Additionally, there are intervening single wind turbines along Corkey Road, Reservoir Road and Gruig Lane forming part of the lower rolling topography agricultural land between the standing stones and the Development. As such, the change in the landscape context would be slight consisting of intermittent tips above a distant ridgeline that does not form part of the setting and which already contains other wind turbines. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

66. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 018:019

67. ANT 018:019 is a motte in a large oval enclosure, likely a bailey that is located 5.8 km west-northwest of T3 in the townland of Knockaholet, as shown in **Figure 11.2**. The motte and bailey are situated on the east side of a steep hill with views in all directions across the undulating agricultural landscape which defines its wider landscape setting. The Development would not change the setting as it is located to the east-southeast, forming part of the distant upland landscape context that is characterised by existing windfarm sites.

68. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines along Corkey Road, Reservoir Road and Gruig Lane forming part of the lower rolling topography agricultural land between the motte and the Development. As such, there would be no change to the setting of the asset with a slight change in its wider landscape context, consisting of intermittent tips above a distant ridgeline in views that already contain other wind

turbines. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

69. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its wider landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 018:046

70. ANT 018:046 is a cross-carved stone located 5.1 km to the north-west of T3 in the townland of Ballyknock Big, as shown in **Figure 11.2**. The stone is situated on an east facing slope of Ballyknock Hill with views to the north and east which define its wider landscape setting. Whilst the turbines are theoretically visible from the stone, the location of the Development, 5.1 km to the south-east, means that there will be no effect on the setting of the asset and key views from it to the north and east remain unchanged

71. The Development would be located to the south-east, forming part of the distant upland landscape context that is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines such as those along Corkey Road and Reservoir Road forming part of the lower rolling topography agricultural land between the stone and the Development. The change in the landscape context of the asset would be slight and would occur in south-easterly views which are not key to the setting of the asset. This would consist of intermittent tips above a distant ridgeline in which turbines are already visible and not alter the significance or character of the monument or the ability to understand, experience, or enjoy it, a negligible magnitude of change.

72. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to the wider landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 18:088

73. ANT 18:088 is a standing stone located 3.8 km north-west of T3 in the Townland of Ballyveely Upper, as shown in **Figure 11.2**. The stone is situated on level ground within a farmyard with views in all directions. There are three other standing stones in close proximity to the north and north-east that are not scheduled (ANT 18:007-009). The setting of the stone is defined by the farmyard and its relationship to the other nearby standing stones with views between stones contributing to the setting.

74. Whilst the turbines are theoretically visible from the stone, the location of the Development, 3.8 km to the south-east, means that there will be no effect on the setting, and key views towards the other stones to the north and east remain unchanged.

75. The Development would be located to the south-east, forming part of the distant upland landscape context that is characterised by existing windfarms. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land between the stone and the Development as seen in the foreground of nearby VP4 at Loughgiel (**Figure 6.26**). As such, the change in the landscape context of the asset would be slight consisting of intermittent tips above a distant ridgeline in which turbines are already visible. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

76. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to the landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 023:004

77. ANT 023:004 is an old graveyard and possible enclosure located 6.1 km to the west of T4 in the townland of Broughanore, as shown in **Figure 11.2**. The scheduled boundary includes the graveyard and nearby souterrain (ANT 023:003). The heritage assets are situated in a pasture field that slopes down to the river at the north-west and south-west but rises steeply upwards to the south-east and east which defines its setting and limits long distance views from the monument. The surrounding landscape is characterised by undulating agricultural land.

78. The Development is not within the asset's setting so that there is no change to its setting. The Development is located to the east beyond the steeply rising land, forming part of the distant upland landscape context that is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land such as those at Corkey Road and Reservoir Road between the monument and the Development. As such, the change in landscape context of the asset would be slight consisting of intermittent tips above a distant ridgeline in which turbines are already sited. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

79. As a scheduled monument of high sensitivity, with no change to its setting and a negligible magnitude of change to its wider landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 023:005

80. ANT 023:005 is a raised rath known as Killagan Fort. It is a circular platform located 6.5 km west of T4 in the townland of Drumadarragh, as shown in **Figure 11.2**. The monument is in low lying farmland on the western bank of Killigan Water, and it does not fall within the ZTV.

81. The setting of the monument is defined by its relationship with Killigan Water with key views to the north and south along the waterway. Whilst the Development is not visible from the heritage asset itself, it is theoretically visible in views across the monument when viewed from the west looking east; however, the Development is not within the setting but rather forms part of the distant upland landscape context to the east that is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land between the monument and the Development, such as those at Corkey Road and Reservoir Road. As such, the change in landscape context would be slight consisting of intermittent tips above a distant ridgeline where turbines are already visible. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

82. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 023:007

83. ANT 023:007 is a raised rath located 3.1 km west of T4 in the townland of Carnamenagh, as shown in **Figure 11.2**. This circular platform is situated within pasture land and contained by a very small field enclosure. There are views to the south, east and west from the monument.

84. The immediate setting of the rath includes the field enclosure and surrounding farmland over which views can be obtained. These views look over an undulating agricultural landscape that contribute to the understanding and enjoyment of the asset, and forms part of its wider settings.

85. The Development would be located to the east beyond the rolling agricultural setting within a separate upland landscape context that is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land between the monument and the Development, such as those at Corkey Road and Reservoir Road. As such, there would be no change in setting and a slight change to its wider landscape context, consisting of turbines visible above a ridgeline in views that already contain other wind turbines. This slight change to the landscape would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change.

86. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 023:015

87. ANT 023:015 is an enclosure situated within rough bog that is located 4.5 km south-west of T4 in the townland of Mount Hamilton, as shown in **Figure 11.2**. The record suggests that it is possibly a fortified island or crannog as local oral tradition speaks of a lake in the vicinity. The enclosure has been damaged by drains cut along field boundaries and within the bog itself

so that the monument is best appreciated in close proximity. Its setting is the bog in which it is located with the surrounding undulating agricultural landscape creating a sense of enclosure around the bog. The Development is not within this setting, and as such, the Development does not impact on the assets setting, nor affect any key views to and from the asset.

88. The Development is located to the north-east beyond the rolling agricultural topography within a separate upland landscape context that is characterised by existing windfarm developments. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south of the Development and Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land between the monument and the Development, such as those at Corkey Road, Reservoir Road and Gruig Lane. As such, the change in landscape context of the asset would be slight consisting of intermittent tips above a distant ridgeline in which turbines are already sited. This would not alter the significance or character of the monument or the ability to understand, experience, or enjoy it and is a negligible magnitude of change

89. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to its landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– ANT 19:001 / ANT 19:002

90. ANT 19:001 / ANT 19:002 is known as Hugh McPhelim O'Neill Tomb due to local folklore which suggests that this is where O'Neill fell during the Battle of Aura in 1559, but they are more likely to be prehistoric burial mounds. They are located 5.2 km north-east of T2 on a north-facing slope of Slieveanorra in the townland of Beaghs, as shown in **Figure 11.2**. They do not fall within the ZTV. The mounds are generally surrounded by commercial forestry plantation which defines the setting and limits both the viewshed from the monument and distant views across the monument. The Development is not visible from the monument and areas to the north, from which views across the monument towards the Development could be obtained, are also not within the ZTV. As such, there is no change to the setting and no effect.

11.5.2.5 Listed Buildings within 5 km Study Area

91. There are 18 listed buildings of low sensitivity (i.e. Category B (B1/B2)) within the 5 km Study Area; all of which fall within the ZTV as shown on **Figure 11.2**. Where appropriate, these have been assessed in groups as detailed in the relevant sections below.

– HB04/05/002/B1

92. This B1 listed building in Loughguile is located 3.5 km north-west of T3, as shown in **Figure 11.2**. It is the former National school and is situated beside the Chapel on the main road through the village. It currently serves as the post office for the village. The setting of the listed building is the village, as this is the community the school would have served. Key views from the listed building are to the west over farmland with views of the listed building obtained from its south along Corkey Road looking north, and from Lough Road heading east approaching Corkey Road. Views from the north looking south along Corkey Road are largely obscured by the adjacent chapel. The upland hills directly behind the school to the east provide the landscape context for the appreciation and understanding of the school and its village location along the foothills. The Development is beyond this to the south-east in a separate upland context so that there is no change to the setting of this listed building, and therefore no effect on this listed building.

– HB04/05/004/B1

93. This B1 listed house is located 2.4 km north-west of T3 along Corkey Road between Loughguile and Corkey, as shown in **Figure 11.2**. The setting of the listed building is defined by its rural location with adjacent farmland to the east forming part of its setting. Modern development to its west along Corkey Road detracts from its appreciation and does not form a valued part of the setting. Key views from the listed building are to the east over farmland with views of the listed building obtained from the drive along Corkey Road looking east. The upland hills directly behind the house to the east provide the landscape context and background for the appreciation and understanding of the house and its rural location. The Development is beyond this to the south-east in a separate upland context so that there is no change to the setting of the listed buildings, and therefore no effect on this listed building.

– HB04/07/001/B

94. All Saints Church is a B listed building situated just to the east of Lissanoure along Ballyveely Road, as shown in **Figure 11.2**. The church is located 4.1 km north-west of T3. The church lies within an area of manicured grounds that make up the churchyard on the western side of Ballyveely Road. It is surrounded by mature vegetation and woodland to its north, south and west with the road to the east which defines its immediate setting. There are glimpsed views of farmland and the upland hills to the east available through hedges and field boundaries. The Development may be intermittently visible in glimpsed views to the east; however, this upland landscape context is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm. As such, the change in landscape context would be slight consisting of turbines visible above a ridgeline in views that already contain other wind turbines, a negligible magnitude of change. As a B listed building of low sensitivity with a negligible magnitude of change in setting, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– Lissanoure Listed Buildings (HB/04/07/002/B, HB/04/07/009B, HB/04/07/010/B1, HB/04/07/0011/B, HB/04/07/012/B, HB/04/07/0013/B, HB/04/07/014/B1/, HB/04/07/015/Record Only)

95. The listed buildings within Lissanoure include Lissanoure Cottage, the Conservatory and Garden House, Stables and Old Castel, Gate Lodge, Gazebo, ruined church, and rectory. They are located 3.8 km north-west of T3, within Lissanoure Historic Park, Garden and Demesnes as shown in **Figure 11.2.** It is this estate grounds which define their setting. This largely 18th century parkland landscape sits within shelter belts and woodland which limits views from the buildings to areas outside of the estate. As such, the Development is not visible from within the grounds of the estate, though may be intermittently visible in glimpsed views of the hills to the east from the eastern estate boundary; however, this upland landscape context is not part of the setting and is characterised by existing windfarm sites. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm. As such, the change in setting would be slight consisting of turbines visible above a ridgeline in views that already contain other wind turbines, a negligible magnitude of change. As B listed buildings of low sensitivity with a negligible magnitude of change in setting, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– HB-04/07/004/B2 and HB04/007/005/B1

96. This B2 listed bridge and B1 listed cottage are located 6 km west of T4, as shown in **Figure 11.2**. The setting of the bridge is defined by its form and function as a crossing over Killigan Water. B1 listed Killigan Cottage is located just to the west of the bridge on the western bank of the waterway. These heritage assets sit in a low-lying area along the Killigan Water so that distant views of the upland hills are not available. As the Development is located over 6 km to the west in the upland hills, the setting of these assets would not change. As B listed buildings of low sensitivity with no change in setting, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

– HB04/007/008/B2

97. Checker Hall is a B2 listed building located 3.4 km west of T4, as shown in **Figure 11.2**. The setting of this house extends to the adjacent agricultural farmland to the north, south and west, whilst woodland directly to its east limits its setting and views in that direction. As the Development is situated to the east, the setting of the listed building would not change, and therefore there would be no effect on this listed building.

– HB04/16/001/B

98. This B listed church in Cloughmills is located 5.4 km south-west of T4, as shown in **Figure 11.2**. The churchyard defines its immediate setting, as infill development largely surrounds the church and limits long distance views. The wider setting of the church is the town of Cloughmills as this is the community the church serves. As the Development is situated over 5 km to the north-east of the church, not within its setting, the setting of the listed building would not change, and therefore there would be no effect on this listed building.

– HB04/16/002/B and HB04/16/006/B2

99. Killigan Parish Church (HB04/16/002) and Drumadoon House (HB04/16/006) are located to the west of Cloughmills, 5.9 and 6.4 km south-west of T4 respectively, as shown in **Figure 11.2**. The setting of the church is its churchyard. The setting of Drumadoon House is defined by land bounded by the A26, Drumadoon Road, and slipway to Killagan Road. The surrounding rural agricultural landscape that surrounds these heritage assets contribute to their appreciation. As the Development is located approximately 6 km to the north-east in the upland hills, the setting of these assets would not change, and therefore there would be no effect on these listed buildings.

– HB07/01/016/B1

100. Beetling Mill is a B1 listed building located 3.1 km south-southwest of T5, as shown in **Figure 11.2**. The mill lies amongst mature vegetation and woodland, adjacent to a small waterway. The vegetation and low-lying area in which it is located limits

long distance views. Glimpsed views are available along the waterway towards the north where Gruig Windfarm is visually prominent. The Development is located beyond this to the north and would be largely hidden in existing landform so that there is no change to the setting of the mill, and therefore there would be no effect on this listed building.

11.5.2.6 Additional Heritage Assets Beyond 5 km Study Area Selected for Assessment

101. There is one heritage feature beyond the 5 km Study Area that has been included in the assessment as requested by Historic Environment Division of Department for Communities. This is Dooey's Cairn (ANT 022:012), a scheduled monument that is in state care, a Neolithic burial court tomb located 9.4 km west-southwest of T4, as shown in **Figure 11.2**. The immediate setting of the cairn is defined by its designation boundary with a small copse of vegetation/woodland to its west and south, Presbytery Lane to the north, and agricultural farmland to its east. Its wider setting is defined by its relationship with other nearby court tombs, the closest of which is Ossian's Grave to the north near Cushendall. There are views from the monument to the north-east which include a modern house and single turbine in the foreground with background view looking across undulating farmland with the upland hills visible as a distant landscape feature.

102. The Development does not form part of the immediate setting but would be visible as part of the distant landscape context of upland hills to the east. Currently, this view already includes the Altaveedan Windfarm, Gruig Windfarm and the existing operational Corkey Windfarm. There are also several single turbines scattered throughout the lower hills and farmland as shown in VP10, **Figure 6.32**, which is located to the north of the cairn along Tullaghans Road. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to its south and nearby Altaveedan to its north. Additionally, there are intervening single wind turbines forming part of the lower rolling topography agricultural land between the monument and the Development, such as those at Corkey Road, Reservoir Road, Gruig Lane and Omerbane Road. As such, the change in landscape context would be slight consisting of intermittent tips above a distant ridgeline, a negligible magnitude of change. As a scheduled monument of high sensitivity with no change to its setting and a negligible magnitude of change to the landscape context, the effect is assessed as negligible which is **not significant** in terms of the EIA Regulations.

11.6 Mitigation and Residual Effects

103. The Core Study Area is considered to have a low potential for unknown archaeological remains to survive due to the existing windfarm on the site and its agricultural use, combined with the limited extension of the Development into new ground. The potential is further limited by the exposed upland moorland nature of the Core Study Area which is not conducive to habitation but more likely utilised for pastoral and transhumance activities.

104. If direct effects were to occur to unknown remains, the effects would be of a potentially large to very large magnitude (damage or complete destruction). The Development has the potential therefore to cause an effect of large to very large magnitude on an asset of low sensitivity. The potential effect is therefore assessed as ranging from minor to moderate, and potentially significant in terms of the EIA Regulations.

105. Mitigation to minimise the potential direct effects of the Development would comprise implementation of a programme of archaeological evaluation, consisting of a targeted watching brief in previously undisturbed portions of the proposed Development footprint only, leading to preservation by record.

106. As there are no direct effects upon any known cultural heritage assets anticipated during the initial decommissioning/construction phases, these have been assessed as **not significant** in terms of EIA Regulations.

Indirect effects on heritage features are assessed in **Section 11.5.2** as being negligible and **not significant** in terms of EIA Regulations.

11.7 Cumulative Effect Assessment

107. This assessment considers the potential for significant cumulative effects to occur on the settings of cultural heritage features. This potential may arise from the addition of the Development to a landscape which includes other consented (but not yet built) and windfarm developments for which a valid planning application has been submitted.

11.8 Cumulative Baseline Description

108. The turbines of the Development would replace the existing Operational Corkey Windfarm. The area in which the Development is sited is characterised by operational wind turbines along a generally north / south running ridgeline consisting of the Operational Corkey Windfarm with Gruig Windfarm adjacent to the south and Altaveedan Windfarm further to its north, as well as numerous operational single turbines scattered throughout the foothills of this ridge and the lower elevation rolling agricultural topography, such as those at Corkey Road, Reservoir Road, Gruig Lane, Moneyduff Road, and Omerbane Road, as shown in **Figure 6.12**. These operational turbines have been considered as part of the baseline in **Section 11.5**.

109. These operational wind turbines characterise the upland and foothills landscape within and around the Development, as evident in viewsheds beyond the 5 km Study Area, as shown in VP10 near Dunloy (**Figure 6.32a**), VP13 near Glarryford (**Figure 6.36a**), and VP17 near Ballymoney (**Figure 6.39b**), and VP18 at Long Mountain (**Figure 6.40a**).

110. Whilst the Development turbines are taller, the Development would be sited within an area that is characterised by operational turbines, as shown in **Figure 6.12**, so that whilst they may be slightly more prominent upon the ridgeline, the effect upon the cumulative baseline is slight, as shown in distant VPs (**Figures 6.32d, 6.35d, 6.39c 6.40e**). Due to this upland and foothills landscape context being characterised by turbines in long distance views beyond 5 km, the likelihood of significant cumulative effects upon heritage assets is limited to those that fall within close proximity to the Development, i.e. within the 5 km Study Area.

11.8.1 Turbines within 5 km Study Area

111. Within the 5 km Study Area there are numerous single turbines consented and a single turbine application in planning included as part of the cumulative assessment. These are largely concentrated at the base of the ridgeline to the west of where the Development would be sited, as shown on **Figure 6.12**.

112. These single turbines are in keeping with the landscape context in and around the Development, in that it would increase the number of single turbines scattered throughout the foothills of this ridge as it transitions into the lower elevation rolling agricultural topography in which the majority of the heritage assets are located, as shown in **Figure 6.12**. Generally, these smaller scale turbines do not extend above the ridgeline as shown in the cumulative wirelines in VP10 near Dunloy (**Figure 6.32a**), VP13 near Glarryford (**Figure 6.35a**), and VP17 near Ballymoney (**Figure 6.39b**), and VP18 at Long Mountain (**Figure 6.40a**). As such, the potential for significant effects upon heritage assets as a result of the Development is restricted to those that lie between the Development and nearby single turbines, i.e. on the slopes below the Development and above the lower elevations where the single turbines are sited.

113. As shown in **Figure 6.12,** there are no Scheduled Monuments or Listed Buildings between the Development and the consented single turbines, with the closest heritage assets being located just to the west of the lower elevation on which the single turbines are sited. From north to south, these include HB04/05/002, ANT018:088, ANT18:085, ANT18:015, ANT018:095, HB04/05/004, HB04/07/008, ANT023:007, and HB/07/01/016). The Development does not lie in the setting of these heritage assets as detailed in **Section 11.5.2**. As such, the more prominent visual effect would be from the single turbines at the lower elevations of the ridge which lie in closer proximity, with the Development forming the landscape context of upland hills to the east of these assets. The cumulative effect is therefore the same as the Development in isolation, as assessed in **Section 11.5.2** and for which no significant effects where identified. In summary, adding the Development to this baseline of single turbines, does not alter the ridgeline and higher elevations in which turbines are already sited. Whilst the Development turbines are taller, the Development would be sited within an area that is already characterised by operational turbines, as shown in **Figure 6.12**, so that whilst they may be slightly more prominent upon the ridgeline, the change to the landscape context is slight, a negligible effect that is **not significant** in terms of EIA regulations.

11.8.2 Windfarms within the Cumulative Study Area

114. The Armoy Windfarm is the only windfarm application within the Cumulative Study Area, and it consists of six turbines, 149.9 m to tip, located approximately 8.8 km north of the Development, as shown in **Figure 6.12**. It is sited in a similar upland hill landscape context. As shown in the cumulative ZTV in **Figure 6.22**, the combined visibility of the two windfarms extends to the west. Due to both the Development and Armoy application being located in the same upland landscape context with the operational Altaveedan Windfarm between, visibility from distances greater than 5 km does not produce significant cumulative effects as turbines in the upland hills are in keeping with distant views from further afield as shown in VP10 near Dunloy (**Figure 6.32a**), VP13 near Glarryford (**Figure 6.35a**), and VP18 at Long Mountain (**Figure 6.40a**). As such, the greatest potential for a cumulative significant effect upon heritage assets would be upon those assets that lie between the Development and Armoy within a similar upland landscape context. As shown in **Figure 6.12**, there are no heritage assets within the upland landscape context located between the Development and Armoy, with the closest heritage asset being ANT019:001/ANT019:002, which does not lie in the ZTV for the Development and would receive no effect as a result of the Development in isolation, as detailed in **Section 11.5.2**. The only cumulative effect should both the Development and Armoy be added to the existing baseline would therefore be a slight change in landscape context consisting of an increase of taller

turbines upon a ridgeline where turbines are already visible, a negligible magnitude of change that is **not significant** in terms of EIA regulations.

11.9 Summary of Effects

115. **Table 11.10** provides a summary of the effects detailed within this chapter.

Table 11.10: Summary of Effects

Receptor	Potential Effect	Significance of Effect	Mitigation Proposed	Residual Effect
Decommissioning / Construction Phase				
Known archaeological remains	None as none are recorded within Development footprint	No Effect	None	No Effect
Unknown (buried) archaeological remains	Damage or destruction to unknown (buried) archaeology should they occur within Development footprint	Minor/Moderate	Watching brief in undisturbed portions of the Development footprint only.	Minor/Moderate but preserved via record
Operation				
Designated Heritage Assets	Indirect (settings) effects	Negligible to No Effect	None	Not significant
Cumulative				
Designated Heritage Assets	Indirect (settings) effects	Negligible	None	Not significant

11.10 Statement of Significance

116. Effects are significant for the purposes of the EIA Regulations where the effect is classified as being of 'major' or 'moderate' significance.

117. There would be no direct effects likely upon known archaeological features within the Core Study Area as none are recorded within the Development footprint. Due to the deliberate re-use of infrastructure associated with the Operational Corkey Windfarm, combined with the exposed upland topography which limits land use to pastoral and transhumance activities, the potential for damage to or destruction of unknown buried archaeological remains is very low. However, should unknown archaeology survive within undisturbed portions of the Development footprint, that haven't already been impacted by ongoing agricultural activity, these would likely be damaged or destroyed resulting in a minor to moderate effect and a programme of archaeological works to secure preservation by record is recommended within these areas only.

118. There would be no significant indirect effects, associated with changes to settings, upon heritage assets in the surrounding historic environment from the Development, in isolation or cumulatively with other windfarm development.

11.11 Glossary

Term	Definition
AOD	Above Ordnance Datum.
Core Study Area	Area contained within the Development Area, the area within which the Development may have direct effects upon known and unknown archaeological remains.
Cumulative Study Area	A 10 km area surrounding the Development. The area in which the potential significant cumulative effect is considered likely if cultural heritage assets within the area lie within the zone of theoretical visibility of more than one wind development.
the Development	the Corkey Windfarm Repowering Scheme
the Site	the area within which the Development will be located

Term	Definition
EIA	Environmental Impact Assessment.
ES	Environmental Statement.
ft	feet
ha	hectare
HB	Historic Building
km	kilometres
m	metres
SMR	Sites and Monuments Record
1 km Study Area	A 1 km radius surrounding the Development Area. The area used to ensure a full understanding of the archaeological resource and so the potential for unknown archaeology to survive within the Core Study Area. See **Figure 11.2**.
5 km Study Area	A 5 km area surrounding the Development. Area within which it is considered the Development has potential to cause likely significant indirect (visual) effects upon the settings of heritage assets and hence requiring detailed assessment. See **Figure 11.2**.
ZTV	Zone of Theoretical Visibility.

12 Access, Traffic and Transport

12.1 Introduction

1. This chapter of the ES assesses the potential traffic and transport effects of the Development, describes the existing transport network within the vicinity of the Site, identifies whether there is any potential for significant effects to arise (both in isolation and in combination with other developments) and outlines any mitigation measures as required. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus).

2. The assessment considers the potential effects of the Development during the following phases of the Development:

- Decommissioning of Operational Corkey Windfarm (Initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

3. The decommissioning of Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development, are considered to be no greater than the effects arising when these two phases are combined. As a result, the final decommissioning phase of the Development has not been considered further in this assessment.

4. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

5. This chapter of the ES is supported by the following Technical Appendices provided in **Volume 3 Technical Appendices** of this ES:

- Technical Appendix A12.1 Abnormal Load Route Assessment – March 2019

6. This chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

12.2 Legislation, Policy and Guidance

7. Table 12.1 details relevant legislation, policy and guidance documents considered during preparation of this assessment.

Table 12.1 Legislation, Policy and Guidance

Policy or Author	Title	Policy
Government Policy		
Strategic Planning Policy Statement (SPPS, 2015)	NA	As noted in paragraph 60 in **Chapter 3**, Planning Policy Statement 3: Access, Movement and Parking (PPS3), its clarification and Planning Policy Statement 13: Transportation and Land Use (PPS13) are retained policies for the purposes of the SPPS transitionary arrangements. In terms of PPS3 and PPS13 there is considered to be no conflict with the equivalent provisions in the SPPS, therefore until the Council adopts its Plan Strategy, PPS3 and PPS13 will apply, together with the SPPS, with no less weight attached to the retained policy. SPPS policy on transportation is set out on pages 106 to 110. It consolidates and restates policy set out in PPS3 (as clarified) and PPS13. The Minister did not identify any conflicts or clarifications in respect of PPS3 (as clarified) and PPS13 in his statement launching the SPPS. The principal planning policy focus of this Chapter is, therefore, on PPS3, since PPS13 is widely accepted not to represent operational policy.
Planning Policy Statement 3 (PPS 3, 2005)	Access, Movement and Parking	This policy sets out the Department of the Environment's planning policies for vehicular and pedestrian access, transport assessment, the protection of transport routes and parking. Policy AMP 2 states: "Planning permission will only be granted for a development proposal involving direct access, or the intensification of the use of an existing access, onto a public road where: Such access will not prejudice road safety or significantly inconvenience the flow of traffic." Policy AMP 2 considers a number of aspects of each development proposal including the number of access points onto a public road, as well as the speed and volume of traffic using the adjacent public road and any expected increase.
Planning Policy Statement 13	Transportation and Land Use	PPS 13 assists with the implementation of the Regional Development Strategy for Northern Ireland, by guiding the integration of transportation and land use. General Principle 3 states that the process of Transport Assessment should be used when considering the potential traffic impacts of a development. General Principle 11 states that "innovative measures should be developed for the safe and effective management of traffic." General Principle 12 states that "the integration of transport and land use planning should seek to create a more accessible environment for all."
Planning Policy Statement 18 (PPS 18, 2009)	Renewable Energy	PPS18 sets out the Department's planning policy for development that generates energy from renewable resources. It identifies the general traffic and transport elements of wind development that may require to be assessed as part of a planning application.
NI Planning Service and Roads Service (DCAN 15, 1999)	Development Control Advice Note 15	This advice note provides general guidance on the standards for vehicular access when an access road from a development requires access to a public road. It sets out the requirements for visibility which apply to developments which access the public road network.
Policy		
Department for Regional Development (2006)	Transport Assessment Guidelines for Development Proposals in Northern Ireland	The guidance document has been prepared to assist in the preparation of Transport Assessments for development proposals in Northern Ireland. It is based on the policies set out in PPS 13. A detailed Transport Assessment is required when the development will generate: "100 or more vehicle movements in the peak hour; - Significant traffic at peak times in a congested area, a sensitive location or an important traffic route or junction; - Significant freight movements; - Traffic late at night in a residential area, particularly lorries; and Raise significant concerns over road safety.
Institute of Environmental Management and Assessment (IEMA, 1993)	Guidelines for the Environmental Assessment of Road Traffic	Sets out guidelines for determining the appropriate and significance of traffic effects as a result of a proposed development. The document focuses on the assessment of potential environmental effects associated with road traffic.

Policy or Author	Title	Policy
Institution of Highways and Transportation. (IHT, 1994)	Guidelines for Traffic Impact Assessment	The guidance document sets out a process for determining the need to carry out a Traffic Impact Assessment (TIA). The process involves three key steps: - Determining whether a TIA is necessary; - If so, what the scope of the TIA should include; and - How to prepare the TIA.

12.3 Assessment Methodology and Significance Criteria

12.3.1 Scoping Responses and Consultation

8. Consultation for this ES topic was undertaken with the organisations shown in **Table 12.2.**

Table 12.2 Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Department for Infrastructure (DfI) – Roads	Scoping Response – 20th September 2017	DfI will require a Traffic and Transportation Chapter to be included within the ES. This Chapter should include a Transportation Assessment of Haul Routes.	Addressed by Chapter.
Department for Infrastructure – Roads	Formal Scoping Opinion – 16th November 2017	*"The Guidelines for the Environmental Impact of Road traffic* do not apply in Northern Ireland. The Transport Assessment Guidelines for Development Proposals in Northern Ireland (November 2006) apply in this jurisdiction."* *IEMA Guidelines *"Operational traffic effects can be scoped out of the assessment."* *"DfI Roads is content with the proposed methodology and scope of the traffic and transportation assessment."*	The Scoping Request stated that the proposed methodology is based upon the IEMA Guidelines. As the suggested Transport Assessment Guidelines (Northern Ireland) do not contain any methodology for the environmental assessment of road traffic, this Environmental Statement has used the methodology contained in the IEMA Guidelines. As requested, as far as they are applicable, the N.I. guidelines have been taken into account. It should also be noted that the Development will not generate: "100 or more vehicle movements in the peak hour; - Significant traffic at peak times in a congested area, a sensitive location or an important traffic route or junction; - Significant freight movements; - Traffic late at night in a residential area, particularly lorries; and Raise significant concerns over road safety. Operational traffic effects have been scoped out of this assessment.
Department for Infrastructure – Roads	Informal discussion regarding proposed Site access junction	DfI stated that all new access junctions should comply with the	**Section 12.5** of this ES and the accompanying **Figure 12.5** included in **Volume 2: Figures** present all information relating to the proposed access and the achievable visibility splay for consideration, as requested.
	visibility splay – February 2019	specifications detailed in DCAN 15. DFI have asked that the applicant should present all available information regarding the achievable splay with the formal application for consideration.	

12.3.2 Scope of Assessment

12.3.2.1 Study Area

9. The assessment Study Area extends to the haul routes between the Site and the nearest major trunk road that are likely to be used by vehicles associated with the Development. In this case between the A26 and the Site entrance. This has been extended to include the A26 itself in order to provide a more robust assessment. The routes considered for abnormal load vehicles (ALVs), used for the delivery of turbine components, routes for heavy goods vehicles (HGVs) and used for the delivery of construction materials, are defined in **Figure 12.1** included in **Volume 2: Figures**

10. The ALV route was defined following the Abnormal Load Route Assessment (ALRA) (included in **Technical Appendix A12.1**) and takes a circuitous route via Armoy in order to access roads with a suitable geometry, and to reduce any required improvement works. The ALRA assesses the route from potential ports of delivery, Larne and Belfast, to the Site entrance.

11. Currently the source of materials required for initial decommissioning/construction phases of the Development is not known, however it is anticipated that the majority of these will be sourced from locations to the west or south of the Site and will therefore be transported via the A26. It is therefore possible that HGVs will access the Site via the shortest appropriate route, as indicated on **Figure 12.1**. The geometry of this route is not suitable for ALVs. This route provides a more direct route to the Site from the A26 and may therefore be more appropriate for HGVs in order to reduce the distance travelled and associated effects on receptors. Scoped in Effects

12. This assessment considers the following access, traffic and transportation effects of the Development during the initial decommissioning/construction phases and operation:

- Traffic Generation;
- Accidents and Safety;
- Driver Delay;
- Pedestrian Amenity;
- Severance;
- Noise and Vibration;
- Hazardous Loads;
- Pedestrian Delay;
- Visual Effects; and
- Air Quality.

12.3.2.2 Scoped Out Effects

13. Operational traffic during the life of the Development is expected to be negligible and therefore, will be scoped out of the assessment. This approach was proposed during Scoping and the methodology was supported by DfI Roads in their Formal Scoping Opinion.

14. The vehicles servicing the Operational Corkey Windfarm have been doing so since 1994, as such they form part of the existing baseline. Since the number of vehicles required to operate and maintain the Development following its construction will be similar to those currently accessing the Site, no significant change is predicted, and therefore consideration of these have been scoped out of the assessment.

12.3.3 Assessment Methodology

12.3.3.1 Baseline Conditions

15. Baseline traffic flow conditions were established on key routes within the vicinity of the Site to enable comparison with the Development traffic. Partial information was acquired from the Department for Infrastructure (DfI) public traffic counts, which included two traffic count locations which are detailed in **Figure 12.2**. Automatic traffic counts (ATCs) were undertaken in January 2018 at a further five locations on the proposed ALV and HGV haul routes, these counts recorded vehicle types, numbers and speeds.

16. Baseline road conditions, including an estimate of traffic flow capacity, were established using information gathered during a route drive over survey and subsequent desk study. Traffic flow capacity was estimated using information contained within DMRB – Volume 15[1], it is acknowledged that this document does not apply in Northern Ireland, however in the absence of a method of estimating capacity within the Northern Ireland Development Control Advice Notes (DCAN) this method has been considered appropriate.

12.3.3.2 Assessment of Effects

12.3.3.2.1 Receptor Sensitivity

17. The sensitivity of receptors has been determined based upon the value of the affected resource as detailed in **Table 12.3.**

Table 12.3 Receptor Sensitivity

Sensitivity	Description
High	Receptors of greatest sensitivity to changes in traffic flow, would include: People whose livelihood depends upon unrestricted movement within their environment including commercial drivers and companies who employ them, local residents, schools and colleges. Accident hotspots would also be considered.
Medium	Traffic flow sensitive receptors, would include: People who pass through the area habitually, but whose livelihood is not wholly dependent on free access. Would also typically include: congested junctions, community services, parks, businesses with roadside frontage, and recreation facilities.
Low	Receptors with some sensitivity to changes in traffic flow: People who occasionally use the road network. Would also typically include: public open spaces, nature conservation areas, listed buildings, tourist attractions, residential roads with adequate footway provision and places of worship.
Negligible	Receptors with very low sensitivity to traffic flows: People not sensitive to transport effects. Would also refer to receptors that are sufficiently distant from the affected roads and junctions.

12.3.3.2.2 Magnitude of Effect

The magnitude of the effect of increase in traffic flow is a function of the existing traffic volumes on haul routes and the percentage increase in flow as a result of the Development.

18. The Department for Regional Development's Guidance[2] suggests that assessment is required for any development which generates 30 or more two-way vehicle movements in any hour.

19. The Institute of Environmental Management and Assessment (IEMA) Guidelines[3] suggest two broad principles, to be used as a screening process to delimit the scale and extent of assessment. These are:

- Rule 1 – include road links where traffic flows are predicted to increase by more than 30% (or where the number of heavy goods vehicles is predicted to increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows are predicted to increase by 10% or more.

20. Where the predicted increase in traffic flow is lower than these thresholds, then the significance of the effects can be considered to be low, or not significant and further detailed assessments are not warranted. Consequently, where the predicted increase in traffic flow is greater than these thresholds, the effects are considered to be potentially significant, and assessed in greater detail.

21. These guidelines are intended for the assessment of environmental effects of road traffic associated with major new developments giving rise to traffic generation, as opposed to short-term construction. In the absence of alternative guidance and, as the traffic generation during the operational phase is very low, these guidelines have been applied to assess the short-term initial decommissioning / construction phases of the Development.

22. It is worth noting that on roads where existing traffic levels are generally low (e.g., rural roads and some unclassified roads), any increase in traffic flow may result in a predicted increase that would be higher than the IEMA (1993) guideline thresholds. In these situations, it is important to consider any increase in terms of overall traffic flow in relation to the capacity of the road before making a conclusion in EIA terms.

23. Any change in traffic flow which is greater than the thresholds set out in the IEMA (1993) guidelines would be subject to further analysis using this method to establish if the increased traffic flow is within the capacity of the road. In instances where traffic flow is higher than the IEMA (1993) guideline thresholds but within the capacity limits of the road, and the potential magnitude on receptors is minor or negligible, this increase would generally be considered to be not significant. It is acknowledged that capacities can be reduced by local conditions.

24. The criteria used to assess the magnitude of change are presented in **Table 12.4.**

Table 12.4 Magnitude of Change

Sensitivity	Description
Major	The proposals could result in an appreciable change in terms of length and/or duration to the present traffic routes or schedules or activities, which may result in hardship.
Moderate	The proposals could result in changes to the existing traffic routes or activities such that some delays or rescheduling could be required, which cause inconvenience.
Minor	The proposals could occasionally cause a minor modification to routes, or a very slight delay in present schedules, or on activities in the short-term.
Negligible	No effect on movement of road traffic above normal level.

12.3.3.2.3 Significance of Effects

25. Two broad principles outlined within the IEMA guidelines are advised for use as a screening process to limit the scale and extent of the assessment as detailed in **Section 12.3.3.2.2.**

26. For the purposes of this assessment and in accordance with the criteria set out within the IEMA guidelines, the scale (magnitude) of any increase in traffic flows on a particular section of the road network as a result of the Development activities will determine the significance of any effects associated with such increases. For example an increase in traffic flows of more than 90% on a particular section of the road network, will likely have a major effect on the road section being assessed.

27. An assessment has been made of the significance of further effects taking into account the importance / sensitivity of the receptor, the magnitude of effect, the duration/ persistence of the effect and the likelihood of the effect occurring. The criteria used to make judgements on the importance/sensitivity of the receptor(s) is presented in **Section 12.3.2.3**. The criteria used to determine the significance of effects is detailed in **Table 12.2**. For the purposes of this assessment, the significance of effects was also assessed on the basis of the specific local characteristics of the road network using professional judgement and experience of similar developments.

[1] Department for Transport, (2013) Design Manual for Roads and Bridges, Volume 15.
[2] Department for Regional Development (2006), Transport Assessment Guidelines for Development Proposals in Northern Ireland
[3] The Institute of Environmental Management and Assessment (1993), Guidelines for the Environmental Assessment of Road Traffic

12.3.4 Embedded Mitigation

28. The proposed haul route has been selected as far as possible to utilise routes which are proven as suitable for the delivery of turbine components. The route will use major trunk roads for as much of its length as possible.

29. A detailed traffic management plan (TMP) would be submitted to relevant consultees, should the Development receive consent, prior to any work commencing. The TMP will contain detailed information on the expected delivery vehicles, routes, improvement works required, timings and details of the escort and management procedures to be implemented for the duration of initial decommissioning/construction phases.

12.4 Baseline Conditions

12.4.1 Access Routes

12.4.1.1 Abnormal Load Haul Route

30. The proposed abnormal load routes to the Site, indicated on **Figure 12.1**, have been assessed from the potential ports of delivery, Larne and Belfast. Turbine components are likely to be transported to either of these ports, and approach the Site via one of the indicated routes.

31. An Abnormal Load Route Assessment (ALRA) was undertaken and is included as **Technical Appendix A12.1**. This assessment considered transportation of wind turbine components from each of the potential ports of delivery via the Abnormal Load Route to the Site, and included a drive over survey of the delivery routes by an Arcus traffic engineer in October 2017. The ALRA identified a number of areas where road modifications will be required in order to enable delivery of the specified turbine components, these are detailed in the ALRA Report.

12.4.1.2 HGV Haul Route

32. The proposed HGV haul route is indicated on **Figure 12.1**. This route has been chosen as it represents the shortest route to the Site entrance from the nearest trunk road, the A26. HGVs will be used to transport a range of materials to the site and will therefore originate from a variety of locations. Due to the absence of major population centres and ports, it is considered unlikely that HGVs will approach the Site from the east. HGVs approaching from the north would likely follow the abnormal load route while those from the south and west are likely to use the following haul route:

- Exit the A26 at the roundabout with the A44;
- Continue northbound on the A44;
- Turn right onto Kilmandil Road;
- Turn left onto Ballyveely Road;
- Turn right onto Ballyweeny Road;
- Turn right onto Corkey Road;
- Turn left onto Reservoir Road; and
- Turn right onto the Site entrance junction.

33. Given that is it is possible that HGVs may approach from the north via the ALV haul route, and in order to ensure a robust assessment, HGV vehicles will be assessed against both routes described in this section.

12.4.2 Baseline Traffic Flow Data

34. Baseline traffic flow data was obtained from the Department for Infrastructure (DfI) at two locations, this data is from 2016 and is the most recent available data at these locations. A seven-day automatic traffic count (ATC) was undertaken by Tracsis Traffic and Data Systems plc from the 8th to the 14th of January 2018 at a further 5 locations. The location of each ATC and DfI count point is indicated on **Figure 12.2** included in **Volume 2: Figures.**

35. Results of the traffic counts including the Average Daily Traffic (ADT), and of the DfI data is provided in **Table 12.5**

Table 12.5 - Existing Average Daily Traffic (ADT)

Ref	Source	Year	Coordinate (Lat Long)	Road	Location	Total ADT	HGV ADT	%HGV
1	ATC	2018	55.02688°, -6.34989°	Kilmandil Road	Approx 1 km east of Drones Road	382	13	3.4
2	ATC	2018	55.03202°, -6.31336°	Ballyweely Road	Approx 750 m east of Lislaban Road	478	30	6.3
3	ATC	2018	55.03492°, -6.28882°	Reservoir Road	Approx 700 m east of Corkey Road	155	4	2.5
4	DfI	2016	55.017426°, -6.3659687°	A44 Drones Road	Approx 100 m north of roundabout with A26	2853	165	5.8
5	ATC	2018	55.13288°, -6.31007°	Coolkeeeran Road	Approx 200 m south of Glenshesk Road	823	12	1.4
6	ATC	2018	55.05852°, -6.27106°	Altnahinch Road	Approx 1.9 km north of Reservoir Road	116	4	3.6
7	DfI	2016	54.905601°, -6.3134915°	A26 Crankill Road	By Clinty Road	18972	1764	9.3

12.4.3 Traffic Growth

36. Background traffic growth will occur on the local road network irrespective of whether or not the Development is constructed. Projected baseline traffic flows for the expected year of construction (assumed to be 2023) have been calculated by applying growth factors.

37. Traffic growth factors have been derived from the National Road Traffic Forecasts[4]. Specific growth factors have been derived for HGV and overall vehicle flow, and to account separately for the 2016 and 2018 traffic survey data. **Table 12.6** details the traffic growth factors and the forecast baseline traffic flow data in the anticipated year of construction (2023).

Table 12.6 - Projected Baseline Traffic in Anticipated Year of Construction (2023)

Ref	Road	Year of Survey Data	Overall Traffic Growth Factor	Projected ADT	HGV Traffic Growth Factor	Projected HGV ADT	%HGV
1	Kilmandil Road	2018	1.055	403	1.178	15	3.4
2	Ballyweely Road	2018	1.055	504	1.178	35	6.3
3	Reservoir Road	2018	1.055	164	1.178	5	2.5
4	A44 Drones Road	2016	1.080	3081	1.269	210	5.8
5	Coolkeeeran Road	2018	1.055	868	1.178	14	1.4
6	Altnahinch Road	2018	1.055	122	1.178	5	3.6
7	A26 Crankill Road	2016	1.080	20490	1.269	2239	9.3

[4] Department for Transport – National Road Traffic Forecasts by Vehicle Type

12.4.4 Road Capacity

38. Typical capacity values for a variety of road types are provided within the Design Manual for Roads and Bridges[5] (DMRB), in which capacity is defined as the maximum sustainable flow of traffic passing in one hour under favourable road and traffic conditions and depends on the road type, speed limit and width. **Table 12.7** gives the theoretical capacity of each of the roads within the Study Area.

39. Where a particular road has multiple sections with different characteristics the section with the lowest capacity has been detailed.

Table 12.7 Theoretical Capacity

Road	Type	Speed Limit (kph)	Capacity (veh/hour/direction)	Two Way Hourly Traffic	Two Way Daily Traffic
Kilmandil Road	Rural – Typical Single 6 m	96	900	1800	43200
Ballyweely Road	Rural – Typical Single 6 m	96	900	1800	43200
Reservoir Road	Rural – Poor Single 5.5 m	96	800	1600	38400
A44 Drones Road	Rural – Typical Single 7.3 m	96	1200	2400	57600
Coolkeeran Road	Rural – Typical Single 6m	96	900	1800	43200
Altnahinch Road	Rural – Typical Single 6m	96	900	1800	43200
A26 Crankill Road	Rural – Dual 2 Lanes	112	3400	6800	163200

12.4.5 Road Traffic Collision Assessment

40. Analysis of all 'serious' and 'fatal' road traffic collisions (RTCs) within the last five years for the routes within the Study Area was undertaken[6]. 'Serious' RTCs are defined as those which result in hospitalisation of one or more of the parties involved. 'Fatal' RTCs are defined as those in which one or more parties' dies within 30 days as a result of injuries sustained.

41. Fourteen 'serious' RTCs were identified in the Study Area. Two further fatal RTCs were recorded, one on the A26 and another on the A44. The RTCs appear to be distributed throughout routes within the Study with no particular clusters or hotspots identifiable. **Figure 12.3** indicates the location of each of the identified RTCs within the Study Area.

42. Of those RTCs identified, consideration is given to those RTCs which involved a heavy goods vehicle (HGV). Four 'serious' accidents occurred within the Study Area, one on the A26, one on the A44 and two on the M2. One 'fatal' RTC involving a HGV occurred within the study, on the A26.

12.4.6 Sensitive Receptors

43. A desk-based study of receptors within the Study Area was undertaken. A number of sensitive were identified as detailed in **Table 12.8**.

Table 12.8 Sensitive Receptors

Receptor	Sensitivity	Reason for Inclusion
Residential properties fronting directly onto haul routes.	High	There are numerous residential properties which front directly on to the proposed ALV and HGV haul routes. Residents of these properties are likely to require unrestricted access to the roads in order to access their place of employment and/or local services. These properties are also likely to be highly sensitive to changes in traffic density, noise and vibration from HGVs etc.
Armoy Primary School	High	This school, located within the settlement of Armoy, is a short distance from the proposed haul route on the A44 Drones Road. Students are highly likely to use Drones Road during their journey to and from school and are likely to be sensitive to the effect of increased traffic flow particularly with regard to severance, pedestrian delay, fear and intimidation and air quality.
The settlement of Armoy	Medium	Included due to the presence of residential and commercial premises which front directly onto the haul route, the A44 Drones Road. This receptor is likely to be sensitive to the effect of increased traffic, and HGV composition with potential effects including severance, pedestrian delay, fear and intimidation, noise and vibration and air quality.
The settlement of Corkey	Medium	Included due to the presence of residential properties which front directly onto the haul route Corkey Road and Reservoir Road. This receptor is likely to be sensitive to the effect of increased traffic, and HGV composition with potential effects including severance, pedestrian delay, fear and intimidation, noise and vibration and air quality.
St Anne's Primary School, Corkey	High	This school is located within the settlement of Corkey and fronts directly on to the proposed HGV haul route on Reservoir Road. Students accessing the school will use Reservoir Road and are therefore likely to be highly sensitive to changes in traffic and HGV flow particularly considering severance, pedestrian delay, fear and intimidation and air quality.

12.5 Site Access Junction

44. A new Site access junction is proposed to be formed on to Reservoir Road, **Figure 12.5** included in **Volume 2: Figures** shows the proposed layout of this junction. An assessment of the achievable visibility splays from this junction was undertaken, and the details of this are indicated on this layout.

45. Visibility at the Site entrance junction is assessed against the standard detailed in DCAN 15[7]. A week long speed survey was undertaken in January 2018 which recorded the 85th percentile speed by the junction location of 39.9 mph. To comply with DCAN 15 this would require a minimum visibility splay of between 90 m and 120 m.

46. The visibility splay achievable from the junction from a 2.4 m setback distance is 160 m in a northerly direction and 70 m to the south. Therefore, the visibility splay to the north exceeds the required standard. To the south the required visibility is not met but exceeds the standard of a number of other existing junctions on Reservoir Road.

12.6 Anticipated Decommissioning / Construction Development Programme

47. A detailed programme of anticipated traffic anticipated throughout the initial decommissioning/construction phases of the Development is provided in **Figure 12.4**. The following subsections provide details of the type and numbers of deliveries anticipated for each element of work; staff and fuelling figures have been detailed separately. A summary of all predicted traffic during these phases is provided at the end of this section.

12.6.1 Site Mobilisation

48. HGV and other vehicle movements will be required during site mobilisation. This will comprise the erection of welfare facilities, delivery of site vehicles and importation of plant and equipment. The majority of these movements will be as HGVs and low loaders which will deliver and then depart the site empty.

[5] Department For Transport, (2013) Design Manual for Roads and Bridges, Volume 15
[6] Data was compiled from publicly available police reports released by the Department for Transport via www.crashmap.co.uk [Accessed 22/01/18]
[7] Department for Infrastructure – Development Control Advice Notes – DCAN 15, Available at https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/dcans/dcan15.htm [Accessed 11/03/19]

Table 12.9 indicates the anticipated number of vehicle movements associated with site mobilisation.

Table 12.9 Anticipated Vehicle Movements – Site Mobilisation

Operation	Vehicle Type	Operational Months	Total	Max Monthly
On-site vehicles	Car/LGV	1	14	14**
Construction compound	HGV Low Loader	1	30	30*
Subtotal			**44**	**44***

*Includes transporter vehicle leaving.
*Self-propelled vehicles.

12.6.2 Turbine Decommissioning

49. The ten wind turbines which comprise the Operational Corkey Wind Farm are to be removed as part of the Development. These turbines will be dismantled and removed from the Site during a two-month period (months 2 and 3).

50. All components from the existing turbines will be removed from the Site by HGV. It is anticipated that five HGVs will be required per turbine. Each of the three blades will require one HGV load with an additional load for the tower section (which may be broken up) and the nacelle. This will result in a total of 100 vehicle movements through the duration of this phase of works.

51. A further two HGV loads per turbine are anticipated for the removal of ancillary equipment, resulting in a total of 40 HGV movements during this phase of works.

52. Additional traffic will be generated by the removal of other items such as turbine transformers, the substation and control building equipment. These items are expected to result in 50 additional traffic movements over the duration of this phase of works. **Table 12.10** details the anticipated vehicle movements associated with turbine decommissioning.

Table 12.10 - Anticipated Vehicle Movements - Turbine Decommissioning

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Turbine and Ancillary Equipment Removal	HGV (Turbines)	2-3	100	50
	HGV (Ancilliary Equipment)	2-3	40	20
Removal of Other Items	HGV	2-3	50	25
Subtotal			**190**	**95**

12.6.3 Access Road and Hardstanding Construction

53. It has been assumed that all the stone required for construction of the access tracks and hardstandings will be imported to the site. As the existing infrastructure is being decommissioned there may be opportunity for the re-use of materials, however in order to assess the worst-case scenario 100% material import has been assumed for the purposes of this assessment. Where materials are re-used the amount of traffic associated with material delivery will be reduced.

54. One team is expected to operate on track and hardstanding construction and may utilise an excavator and roller with imported material being delivered directly to the construction area. It is estimated that the total volume of stone required to be imported to the Site is 34,354m^3. Assuming each load will be transported by aggregate tipper truck with a volumetric capacity of 13m^3 this will result in approximately 2643 loads, or 5286 total vehicle movements through the duration of this element of works.

55. It is assumed that the excavators and rollers will be delivered to the Site via low loaders at the commencement of this stage and will generate two vehicle trips each for delivery and another two trips during removal.

56. Other materials will require to be imported regularly throughout construction of the access tracks such as geo-membrane, drainage pipes and culvert sections.

57. **Table 12.11** indicates the anticipated number of vehicle movements associated with access track and hardstanding construction.

Table 12.11 Anticipated Vehicle Movements - Access Tracks and Hardstanding Construction

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Equipment	HGV Low Loader (Excavators/Rollers)	2-4	8	4*
Stone Import	HGV Tipper Truck	2-4	5286	1762
Other Materials	HGV	2-4	18	6
Subtotal			**5312**	**1772***

*Includes transporter vehicle leaving and then returning to site following completion of track construction
**Self-propelled vehicles which arrive in one month and depart in another

12.6.4 Turbine Foundation Construction

58. The concrete for each turbine foundation will be formed from ready-mix concrete imported to the Site. Each turbine foundation will be poured in one continuous session over a single day, with 5 non-consecutive days required in total over the 8 week duration of this element of works.

59. Each foundation will comprise 500 m^3 of concrete, which will require 56 ready-mix vehicle loads, assuming a capacity of 9 m^3 per vehicle. This will result in a total of 280 loads of concrete or 560 vehicle movements over the 8 weeks of this phase of works.

60. Additionally, 303 tonnes of steel reinforcement (rebar) will be required, this will result in 17 HGV loads, or 34 vehicle movements, over this period. **Table 12.13** indicates the anticipated number of vehicle movements associated with turbine foundation construction.

Table 12.12 - Anticipated Vehicle Movements - Turbine Foundation Construction

Operation	Vehicle Type	Operational Months	Total	Max (Daily/Monthly)
Concrete Delivery	Ready Mix HGV	3-4 (5 days)	560	56 (daily)
Rebar Delivery	HGV	3-4	34	17 (monthly)
Subtotal			**514**	**-**

12.6.5 Control Building, Substation and Energy Storage Unit Construction

61. Material for construction of the substation compound hardstanding is included in the access track and hardstanding movements, detailed in **Section 12.7.3**. Electrical components and switchgear will require to be imported and is predicted to total 20 HGV movements over the five-month phase of this element.

62. Concrete for the formation of the control building foundations will require to be imported at the commencement of this phase of works, this is assumed to be ready-mix concrete and will total 4 concrete wagons, resulting in 8 vehicle movements. Other materials for the construction of the control buildings, which includes the Energy Storage Unit, will require to be imported throughout this phase and is assumed to require 5 deliveries, resulting in a total of 10 HGV movements.

63. The Energy Storage Units themselves will be delivered by standard HGV and are expected to require 10 deliveries, resulting in 20 total HGV trips over the course of this phase of works.

Table 12.13 - Anticipated Vehicle Movements - Control Building, Substation and Energy Storage Unit Construction

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Electrical Components and Switchgear	HGV	3-7	20	4
Batteries	HGV	3-7	20	4
Control Building Materials	Concrete Wagon	3	8	8
	HGV	3-7	10	2
Subtotal			**58**	**18***

*Total in peak month for this element of work

12.6.6 Electrical Cable Delivery

64. Electrical cabling required for the internal windfarm power distribution has been estimated based on the length of access track and number of turbines and will require to be delivered constituting 24 HGV movements over the period of delivery. **Table 12.14** indicates the number of vehicle movements associated with electrical cabling delivery.

Table 12.14 - Anticipated Vehicle Movements - Electrical Cabling Delivery

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Electrical Cabling Delivery	HGV Low Loader	4-5	24	12

12.6.7 Crane Delivery

65. A large mobile or crawler crane of approximately 1,000 tonne capacity will be required for turbine erection along with an additional 160 tonne pilot crane. The crawler crane will be transported in component form and assembled on the Site; this will require approximately 52 HGV movements to be undertaken prior to the commencement of turbine delivery. The pilot crane will be self-propelled although will constitute an abnormal load vehicle due to its weight.

66. Turbine delivery will also require the use of two 160 tonne cranes for unloading turbine components from ALVs. These cranes will be self-propelled although will constitute abnormal loads due to their weight.

67. Cranes will remain on site for the duration of the turbine assembly phase. **Table 12.15** indicates the number of vehicle movements associated with crane delivery.

Table 12.15 - Anticipated Vehicle Movements - Crane Delivery

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Crawler Crane	HGV	4, 7	52	26
Pilot Crane	ALV	4, 7	2	1*
Turbine Delivery Cranes	ALV	4,7	4	2*
Subtotal			**58**	**29**

*Self-propelled vehicle which arrives in one month and departs in another

12.6.8 Turbine Delivery

68. Turbines will be delivered as separate components the majority of which will require to be transported by ALV. The towers will be transported in three separate sections and each of the three blades will be transported individually. Two further abnormal load vehicles will be required to transport the nacelle and hub. For the 5 turbines, 40 ALV deliveries will be required equalling 80 vehicle movements. Following delivery of components, the abnormal load vehicles are able to retract to the size of a standard HGV vehicle for the return journey.

69. Two escort vehicles are likely to be required to accompany each abnormal load which will result in a worst case of 160 additional vehicle movements. In practice, this figure may be reduced where abnormal load vehicles approach the Site in convoy and fewer than two escort vehicles per abnormal load are required.

70. Additionally, 12 HGV vehicle movements will be required for the delivery of turbine accessories and ancillary equipment. **Table 12.16** indicates the number of vehicle movements that are expected for turbine delivery.

Table 12.16 - Anticipated Vehicle Movements - Turbine Delivery

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Turbine Components	ALV/HGV	5-6	80	40
	Escort Car/Van	5-6	160	80
Ancillary Equipment	HGV	5-6	12	6
Subtotal			**252**	**126**

12.6.9 Site Restoration and Demobilisation

71. During site restoration and demobilisation, the principle vehicle movements will be generated from the removal of plant and equipment from the Site. This is anticipated to result in the same number of vehicle movements as for mobilisation, however will be distributed over a two-month period. **Table 12.17** details the anticipated vehicle movements during this phase of works.

Table 12.17 - Anticipated Vehicle Movements - Site Restoration and Demobilisation

Operation	Vehicle Type	Operational Months	Total	Max Monthly
On-site vehicles	Car/LGV	7-8	14	7**
Construction compound	HGV Low Loader	7-8	30	15*
Subtotal			**44**	**22***

*Includes transporter vehicle leaving.
*Self-propelled vehicles.

12.6.10 Fuel Delivery

72. Fuel will require regular delivery to the Site regularly throughout the construction period and is expected to total 1 HGV fuel tanker delivery every two days from Site mobilisation, totalling 208 vehicle movements over the duration of construction. **Table 12.18** indicates the number of vehicle movements associated with fuel delivery.

Table 12.18 - Anticipated Vehicle Movements - Fuel Delivery

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Fuel Delivery	HGV Fuel Tanker	1-8	208	26

12.6.11 Construction Personnel and Staff

73. Based on experience of similar projects, it is anticipated that an average of 40 staff will be required onsite per day throughout the construction phase, months 1-8. For the purposes of this assessment, a worst-case scenario in which all cars are single-occupancy has been assumed. This will result in 80 vehicle movements associated with staff per day.

74. Assuming a 26-day working month, this is expected to result in a total of 16,640 vehicle trips for staff over the course of construction of the Development. **Table 12.19** indicates the number of vehicle movements associated with staff.

Table 12.19 - Anticipated Vehicle Movements - Staff

Operation	Vehicle Type	Operational Months	Total	Max Monthly
Staff	Car	1-8	16,640	2080

12.7 Assessment of Effects

12.7.1 Traffic Generation

75. A detailed breakdown of the distribution of vehicle movements in each month, and for each element of work, throughout the construction phase of the Development is included in **Figure 12.4**. The peak month of construction, from a traffic perspective, was identified and was used to predict the traffic increase on routes within the Study Area. A worst case scenario in which all predicted traffic passes each location within the Study was assumed.

76. From inspection of the predicted traffic movements, the peak month for vehicle flows is expected to be month 3 where there will be a maximum of 4284 vehicle movements in total. This would be comprised of 1924 HGV movements (excluding concrete delivery) and 2080 car or van movements.

77. In addition, concrete deliveries are scheduled to be undertaken during this month and will comprise 56 HGV movements per day over a maximum of 5 non-consecutive days (assuming a 26 day working month). This would result in a total of 280 HGV movements associated with concrete delivery. In practice the number of concrete deliveries during this month can be expected to be less as in total there will be only 5 non-consecutive days of concrete delivery distributed over a 2 month period.

78. **Table 12.20** details the anticipated vehicle flow in the peak month on days with no concrete deliveries and the percentage increase above the predicted baseline at each point within the study.

Table 12.20 - Predicted Peak Month Average Daily Traffic - No Concrete Delivery

		Total Vehicles			HGV Only		
Ref	Road	2022 Baseline	Peak Month	%Increase	2022 Baseline	Peak Month	% Increase
1	Kilmandil Road	403	557	38	14	88	540
2	Ballyweely Road	504	658	31	32	106	233
3	Reservoir Road	164	318	94	4	78	1810
4	A44 Drones Road	3081	3235	5	179	253	41
5	Coolkeeeran Road	868	1022	18	12	86	609
6	Altnahinch Road	122	276	126	4	78	1680
7	A26 Crankill Road	20490	20644	1	1906	1980	4

79. **Table 12.21** details the anticipated vehicle flow in the peak month on days where concrete deliveries will take place, this will occur on a maximum of 5 non-consecutive days although is expected to be significantly less than this.

Table 12.21 - Predicted Peak Month Average Daily Traffic - During Concrete Delivery

		Total Vehicles			HGV Only		
Ref	Road	2022 Baseline	Peak Month	%Increase	2022 Baseline	Peak Month	% Increase
1	Kilmandil Road	403	613	52	14	136	890
2	Ballyweely Road	504	714	42	32	154	384
3	Reservoir Road	164	374	128	4	126	2984
4	A44 Drones Road	3081	3291	7	179	301	68
5	Coolkeeeran Road	868	1078	24	12	134	1004
6	Altnahinch Road	122	332	172	4	126	2769

		Total Vehicles			HGV Only		
Ref	Road	2022 Baseline	Peak Month	%Increase	2022 Baseline	Peak Month	% Increase
7	A26 Crankill Road	20490	20700	1	1906	2028	6

80. As detailed in **Section 12.3.3.2.2** a screening exercise was undertaken in order to determine which routes warrant detailed assessment. Given that each route within the Study Area contains a number of high sensitivity receptors (as summarised in **Section 12.3.3.2.1**) the lower threshold of significance (10%) was used. Using this criteria, and considering the percentage increases presented in **Table 12.20** and **Table 12.21**, it can be seen that there is a potential for effects on all routes, with the exception of the A26, throughout the initial decommissioning and construction phases of the Development. The percentage increase in overall traffic on the A44 is below the 10% threshold, however this will be exceeded for HGVs.

81. When considering the effect of traffic generation on routes which have a low baseline traffic flow, it is important to consider in the context of the capacity of the routes in question. **Table 12.22** outlines the theoretical route capacity of each road within the Study Area. As evidenced, all routes within the Study Area are operating significantly below capacity and are predicted to continue to do so during the peak month of construction of the Development.

Table 12.22 - Residual Capacity

Ref	Road	Theoretical 24hr Capacity	Peak Month Flow – Non Concrete Days	Peak Month Flow – During Concrete Delivery
1	Kilmandil Road	43200	557	613
2	Ballyweely Road	43200	658	714
3	Reservoir Road	38400	318	374
4	A44 Drones Road	57600	3235	3291
5	Coolkeeeran Road	43200	1022	1078
6	Altnahinch Road	43200	276	332
7	A26 Crankill Road	163200	20644	613

82. It is therefore concluded that the effect of traffic generation on routes within the Study Area is low and **not significant** in terms of the EIA Regulations.

12.7.2 Accidents and Safety

83. A road traffic collision (RTC) assessment identified a number of collisions within the Study Area, as detailed in **Section 12.4.5.** All of the recorded RTCs occurred on the A26 or A44. No trends or hotspots could be identified from the data. In the absence of any other identifiable factors, an increase in traffic flow or change in composition is not sufficient to affect a change in safe operation of the road network.

84. It is therefore considered that the temporary increase in overall traffic, and HGVs, for the duration of construction of the Development is not likely to result in an effect on accidents and safety. The effect on accidents and safety is considered to be negligible and **not significant** in terms of the EIA regulations.

12.7.3 Pedestrian Amenity

85. Pedestrian amenity, fear and intimidation can be affected by changes to traffic flow and composition. The majority of routes within the Study Area do not have pedestrian footways, except where they pass through settlements, and it is considered unlikely that significant pedestrian traffic is present outside of settlements. The effect of increased traffic on pedestrian amenity on routes outside of settlements is therefore considered to be low and **not significant** in terms of the EIA regulations.

86. St Anne's Primary School is located in the settlement of Corkey and fronts directly on to the proposed HGV haul route on the corner of Corkey Road and Reservoir Road. Students of this school are likely to use the haul route for part of their journey to and from school and are likely to require to cross the road to access the school. No formal pedestrian crossing is present within the vicinity of the school, and it is not known if a crossing patrol is present during school opening and closing.

87. On Reservoir Road, in the vicinity of St Anne's Primary School, overall traffic is predicted to increase by 94% on non-concrete delivery days and 128% and during concrete delivery. HGV levels are predicted to increase by 1786% and 2960% on non-concrete and concrete days respectively. It is therefore considered that the effect on pedestrian amenity has the potential to be high and should be considered major and **significant** in terms of the EIA regulations. Therefore, mitigation measures which relate to this effect are detailed in **Section 12.9.**

12.7.4 Driver Delay

88. All routes within the Study Area are operating significantly below their theoretical capacity, and are predicted to continue to do so during the peak month of construction of the Development. The effect of general increase in traffic on driver delay is therefore considered to be negligible and **not significant** in terms of the EIA regulations.

89. Some driver delay is expected to occur on routes due to the slow movement of abnormal load vehicles between the port and the Site entrance. Abnormal load deliveries will be timed to avoid peak times. On dual carriageways/motorways, namely the M2 and A26, the effect is likely to be minimal as vehicles will be able to overtake slow moving ALVs. The principal effect will occur from the A44 onwards, however due to the short distance which ALVs are required to travel on this route (approximately 16 km) the effect is unlikely to be significant. It is therefore considered that the effect of ALVs on driver delay is low and **not significant** in terms of the EIA regulations.

12.7.5 Severance

90. Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The proposed ALV route passes through a number of settlements, notably Armoy and Corkey, which have the potential to be affected by severance. Isolated properties along a road do not form part of a community that could be separated by increased traffic, and therefore do not have the potential to receive severance effects.

91. Armoy is located on the A44, which is a trunk road. Overall traffic is predicted to increase here by a maximum of 7% on concrete delivery days and 5% on non-concrete days during construction of the Development. As detailed in **Table 12.22** significant residual capacity will remain on the route throughout construction. It is therefore considered that the effect of severance is negligible and **not significant** in terms of the EIA Regulations.

92. Corkey is located on Corkey Road and Reservoir Road which form part of the HGV haul route. Overall traffic levels are predicted to increase on Reservoir Road by 96% and 130% during non-concrete and concrete delivery days respectively. Whilst these levels are considerably above the threshold of significance it is important to consider the absolute level of traffic. A maximum of 347 vehicles per day are predicted to use this road, and these will be distributed throughout the day. As detailed in **Table 12.22** considerable residual capacity remains on the road. It is therefore considered that the temporary effect of increased traffic on severance in the settlement of Corkey, is low and **not significant** in terms of the EIA Regulations.

12.7.6 Noise and Vibration

93. Ground-borne vibration resulting from heavy goods vehicle and turbine delivery vehicle movements is generally only likely to be significant where vehicles traverse discontinuities, such as rough surfaces (including pot-holes) or speed-humps. There is no evidence that suggests traffic induced vibrations are a source of significant damage to buildings.

94. Airborne vibrations resulting from low frequency sound emitted by vehicle engines and exhausts can result in detectable vibrations in building elements such as windows and doors and cause disturbance to local people. However due to the short-term temporary nature of the increase in traffic movements, it is considered that the effect of vibration upon receptors along the route would be low and **not significant** in terms of the EIA Regulations.

12.7.7 Hazardous Loads

95. Fuel will be regularly transported to the Site, although this will occur only eight times over the duration of construction of the Development. All fuel will be transported by suitably qualified contractors and all regulations for the transportation and storage of hazardous substances will be observed. No other hazardous substances are expected to be transported to site.

96. It is therefore considered that the effect of the transportation of hazardous substances is negligible and **not significant** in terms of the EIA Regulations.

12.7.8 Visual Effects

97. The movements of ALVs could be considered visually intrusive. This effect would be short-term and would only occur during the movement of abnormal loads. It is therefore considered the visual effect as a result of the ALVs upon receptors along the routes would be negligible and **not significant** in terms of the EIA Regulations.

12.7.9 Air Quality

98. Maintaining good local air quality is essential for the human health and overall quality of life for people living in the area. Road transport accounts for a significant proportion of emissions of a number of pollutants including carbon dioxide (CO2), nitrogen dioxide (NO_2) and particulate matter (PM_{10}). Nitrogen oxide emissions are also of concern for nearby vegetation and ecosystems.

99. This assessment considers that as the increase in traffic on haul routes is temporary and reversible that the effect on air quality is negligible and **not significant** in terms of the EIA Regulations.

12.8 Assessment of Cumulative Effects

100. Significant cumulative effects may occur during initial decommissioning / construction phases of the Development where this overlaps with construction of another nearby development. Proposed developments which have the potential to result in cumulative effects were identified from those included in **TA2.3 Cumulative List** and are as follows:

- Armoy (6 turbines);
- Craig 1 (1 turbine);
- Craig 2 (1 turbine);
- Corkey Road 3 (145) (1 turbine);
- Drumbare Road (29) (1 turbine);
- Ballycegagh Road (1 turbine);
- Corkey Road (18) (1 turbine);
- Ballyveely Road (96) (1 turbine);
- Ballyveely Road (99) (1 turbine);
- Mount Hamilton Road (30) (1 turbine);
- Coolkeeran Road (134) (2 turbines);
- Loughill Road (48) (1 turbine);
- Knockahollet Road (76) (1 turbine); and
- Drones road (250) (1 turbine).

101. **Table 12.23** provides daily traffic generation figures that have been assumed for each of the identified developments. Exact traffic data is not available for the identified developments and in order to provide a reasonable assessment, it has been assumed that traffic generation for each project will be in proportion to that generated by the Development (calculated pro-rata, per turbine).

102. Traffic relating to the delivery of concrete during foundation pours has not been included as it is assumed that, given the relative impacts, these events will be timed to ensure they do not coincide. It is unlikely that the local capacity for concrete production could accommodate several pours coinciding in any case.

Table 12.23 - Extrapolated Cumulative Daily Traffic Movements from Identified Developments (Peak Month - Non-Concrete Pour Days)

Development	Planning Application No.	No. Turbines	Total Traffic	HGV
Corkey	LA01/2019/0303/PAN	5	213	73
Armoy	LA01/2017/1654/F	6	256	90
Craig 1	G/2013/0393/F	1	43	15
Craig 2	LA02/2015/0657/F	1	43	15
Corkey Road 3 (145)	D/2012/0028/F D/2013/0188/F	1	43	15
Drumbare Road (29)	D/2009/0295/F, D/2010/0218/F, D/2015/0038/F, LA01/2016/13344/F	1	43	15
Ballycregagh Road (1)	D/2009/0335/F, D2013/0063/F	1	43	15
Corkey Road (18)	D/2014/0017/F	1	43	15
Ballyveely Road (96)	D/2012/0228/F, D/2015/004/F	1	86	30
Ballyveely Road (99)	LA01/2018/1144/F	1	43	15
Mount Hamilton Road (30)	D/2011/01707/F	1	43	15
CoolKeeran Road (134)	D/2011/0195/F	2	43	15
Loughill Road (48)	D/2010/0238, D/2013/0141/F	1	213	73
Knockahollet Road (76)	D/2006/0071/F	1	43	15
Drones Road (250)	D/2012/0041/F, D/2013/0073/F	1	43	15
Total		**15**	**1066**	**373**

103. The cumulative traffic associated with the identified developments will primarily result due to the import of materials and from staff movements. For the purposes of this assessment, it has been assumed that all traffic will use each road within the Study Area; however, as a number of the identified developments are located in various locations within the vicinity of the Development the traffic using each road will be less than stated.

104. **Table 12.24** indicates the anticipated total traffic (including baseline) and the percentage increase above baseline in the worst-case cumulative scenario.

Table 12.24 - Cumulative Daily Traffic Increase (Peak Month - Non-Concrete Pour Days)

		Total Vehicles			HGV Only		
Ref	Road	2022 Baseline	Peak Month	% Increase	2022 Baseline	Peak Month	% Increase
1	Kilmandil Road	403	1469	264	14	387	2722
2	Ballyweely Road	504	1570	211	32	405	1174
3	Reservoir Road	164	1229	652	4	377	9124
4	A44 Drones Road	3081	4147	35	179	552	209
5	Coolkeeeran Road	868	1934	123	12	385	3069
6	Altnahinch Road	122	1188	871	4	377	8466
7	A26 Crankill Road	20490	21556	5	1906	2279	20

105. As indicated in **Table 12.24** the addition of all construction traffic from all identified cumulative developments results in a worst case increase of 871% at location reference 6 on Altnahinch Road over baseline flow.

106. There is sufficient residual capacity on each of the roads within the Study Area to accommodate the predicted increase in traffic which may occur in the cumulative scenario. The likelihood of all of the identified developments being constructed simultaneously is considered low. In the event that a number of the identified developments are scheduled to be constructed simultaneously then it is assumed that their Traffic Management Plans would be agreed in consultation to minimise disruption. For these reasons the likely impact is expected to be significantly lower than stated in **Table 12.24**.

107. The impact on traffic and transport due to cumulative effects is therefore considered to be low and **not significant** in terms of the EIA Regulations.

12.9 Mitigation Measures

12.9.1 Site Entrance Junction

108. Baseline traffic flow at the Site entrance location on Reservoir Road was recorded as 164 average daily traffic, which is low. The maximum number of construction vehicles which can be expected to access the Site during the peak month of construction is 209 vehicle movements per day over a temporary period of one month.

109. Appropriate warning signage is proposed to be installed on Reservoir Road on approach to the Site entrance junction in order to warn approaching drivers of the possibility of vehicles at the junction. The use of signage will also be used on Reservoir Road within the vicinity of the junction to advise drivers that they should be anticipating the need to slow down, which should also better facilitate two-way traffic flow. Liaison with the local community will be regularly undertaken to ensure that residents are advised of any peak decommissioning / construction traffic activity and the proposed timings of any traffic movements associated with the delivery of the turbine components, this will form part of the Traffic Management Plan (TMP).

110. Considering the achievable splay of 70 m to the south exceeds the standard of a number of existing accesses on Reservoir Road, and that the general standard and width of the road predisposes drivers to anticipate the need to slow down it is considered that with appropriate warning signage that the proposed junction can operate safely without the need for any further sightline improvements. As discussed in **Section 12.3.2.2.,** during operation traffic flows to and from the Site will be limited to regular maintenance visits and are considered to be part of the current baseline, as such these effects have been scoped out.

12.9.2 Effects from Traffic Generation

111. One potentially significant effect was identified in **Section 12.7** relating to pedestrian amenity at St Anne's Primary School in Corkey. In order to address this effect, a number of mitigation measures are proposed which are recommended for adoption in the TMP as follows:

- As far as reasonably possible deliveries should be scheduled outside of school opening and closing times;
- Where deliveries are required to take place during school opening and closing times these should be routed via the ALV delivery route through Armoy, in order to avoid passing through Corkey;
- Drivers of all delivery vehicles to be made aware during induction of the presence of schools within these settlements and that formal pedestrian crossing facilities are not present; and
- Corkey has a 30-mph speed limit. Drivers to be made aware of this during induction and reminded that strict adherence to this is expected.

112. The above measures are recommended; however, the TMP will detail the agreed measures to be implemented during the initial decommissioning / construction phases of the Development, and this can be requested and secured via a condition of consent.

113. Making reference to the final outcome of this assessment, the TMP will detail the approved HGV haul route and this information will be distributed to delivery contractors and drivers. The TMP will define which route is to be used by vehicles depending on their direction of approach, and will detail measures to be undertaken to enforce these routes.

116. It is considered that if the above mitigation measures are implemented for

12.10 Residual Effects

114. It is considered that if the above mitigation measures are implemented for the duration of the initial decommissioning/construction phases then the effect of increased traffic on pedestrian amenity will be reduced to low and **not significant** in terms of the EIA Regulations.

12.11 Summary

115. An assessment of the potential effects on traffic and transport during initial Decommissioning, Construction and Operational phases of the Development has been undertaken. This assessment identified one location where there is a potential for significant effects to occur. Mitigation measures have been detailed. As a result, all residual effects of the Development on traffic and transport resource are considered at a maximum low, and **not significant**, in terms of the EIA regulations.

13 Tourism, Recreation, Land-Use and Socio-Economics

13.1 Introduction

1. This Chapter of the ES assesses the potential effects of the Development on the tourism and recreation, land-use and socio-economic resources, identifies whether there is any potential for significant effects to arise (both in isolation and in combination with other developments) and outlines any mitigation measures as required. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus) and BiGGAR Economics Ltd. The assessment will consider the potential effects during the following phases of the Development:

- Decommissioning of the Operational Corkey Windfarm (Initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (Final Phase).

2. The initial decommissioning phase of the Operational Corkey Windfarm and the construction phase is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents the worst-case assessment parameters, when compared with the decommissioning of the proposed five wind turbines and associated infrastructure alone. Therefore, effects during this later decommissioning phase is therefore not considered further in this chapter.

3. This Chapter of the ES is supported by the following Technical Appendix document provided in **Volume 3 Technical Appendices**:

- Technical Appendix A13.1: Corkey Wind Farm: Socio-Economic Assessment

4. This Chapter includes the following elements:

- Legislation, Policy and Guidance;
- Assessment Methodology and Significance Criteria;
- Baseline Description;
- Assessment of Potential Effects;
- Mitigation and Residual Effects;
- Cumulative Effect Assessment;
- Summary of Effects;
- Statement of Significance; and
- Glossary.

5. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4**.

13.1.1 Study Areas

13.1.1.1 Tourism Study Area

6. For the tourism and recreation receptors, the study area is defined as land within the Site Boundary at the time of Scoping in considering direct effects, and within 10 kilometres (km) of the Site Boundary at the time of Scoping in considering indirect effects ('the Tourism and Recreation Study Area'). Cumulative effects (that may arise as a result of adding the Development to a baseline that includes other, proposed developments that are yet to be constructed and those currently operational) are considered within the same area, noting that the proposed developments with the potential to contribute to such effects may be up to 20 km of the Site Boundary at the time of Scoping.

7. These Study Areas are shown in **Figure 13.1**.

13.1.1.2 Land Use Study Area

8. The Land-Use Study Area is defined as the footprint of the Development, either temporarily during the initial decommissioning/construction phases or permanently during the operational stage, but reversible if the Development is decommissioned in the future, as shown in **Figure 3.2** and described within **Chapter 3 Section 3.3**.

13.1.1.3 Socio-Economic Study Area

9. For the socio-economic assessment, the Study Area comprises the Causeway Coast and Glens Borough Council area ('the Local Study Area') and Northern Ireland ('the Regional Study Area').

13.1.2 Design Parameters

10. The details of the Development are set out in **Chapter 3: Development Description** and shown in **Figure 3.2.** No further design parameters were considered as part of this assessment.

13.1.3 Elements Assessed in Full

13.1.3.1 Tourism and Recreation Consideration

11. The key issues for the assessment of potential tourism and recreation effects relating to the Development are:

- Indirect effects, including reduction in amenity or intrusion, changes in the setting and context of the recreational resource; and
- The potential for cumulative effects of the same type as set out above in combination with other developments.

13.1.3.2 Land Use Considerations

12. The key issues for the assessment of potential land use effects relating to the Development are:

- Both temporary and permanent, yet reversible effects associated with the use of the land for Development infrastructure, which would be removed in the event that the infrastructure is decommissioned.

13.1.3.3 Socio-Economic Considerations

13. The key issues for the assessment of potential socio-economic effects relating to the Development are:

- Direct effects, both temporary and permanent, arising from the employment opportunities generated during the initial development, decommissioning/construction and operational stages of the Development and the associated indirect economic effects (both temporary and permanent) to the wider area such as the impact of employees spending their salaries in the local area; and

- The potential for cumulative effects of the same type as set out above were also assessed.

13.1.4 Elements Scoped Out of Assessment

13.1.4.1 Tourism and Recreation Considerations

14. Where appropriate, other potential effects that could have an indirect effect on tourism, recreation receptors have been assessed in the following chapters:

- Potential landscape and visual effects have been considered in **Chapter 6: Landscape and Visual Amenity**;
- Potential noise effects have been considered in **Chapter 10: Noise**;
- Potential effects upon the setting of cultural heritage assets have been considered in **Chapter 11: Archaeology and Cultural Heritage**; and
- Potential traffic effects have been assessed in **Chapter 12: Access, Traffic and Transport.**

15. Where relevant and as set out in **Section 13.1.3.1**, the effects assessed for the above topics, are also considered and form part of the assessment set out in this chapter, particularly with regards to assessing the effects on the tourism and recreation resource.

16. As detailed in the **Technical Appendix 2.1** Scoping Request no tourism or recreational resources are located within the Site and therefore no direct effects are anticipated upon tourism and recreation resources as a result of the Development. No consultees queried the proposed approach within the Scoping Request on this matter, so it is taken as being agreed.

17. In addition, and as detailed in the Scoping Request, due to the lack of visibility of the Development (as shown in **Figure 6.6a**) from the following tourism and recreational receptors, and distance between these and the Site, they will not be further assessed in this EIA:

- Glenariff Forest Park (8.4 km southeast of the Site Boundary at the time of scoping);
- Causeway Coast and Glens (including the Giant's Causeway (c. 20 km), Carrick-a-Rede Rope Bridge (c. 20 km), Dunluce Castle (c. 20 km), Old Bushmills Distillery (c. 20 km), Mussenden Temple (c. 25 km) and Downhill Demesne (c. 25 km)); and
- Croaghan Way (7 km north of the Site Boundary at the time of scoping).

18. In addition, and as informed by **Chapter 6: Landscape and Visual**, **Section 6.10**, no visual effects on the Sileveanorra Forest will occur, predominantly due to the forestry itself acting as screening (located 2.5 km east of the Site Boundary at the time of scoping) and therefore the Forest has also been scoped out from further assessment.

19. Again, no further comments were made with regards to this approach to the Scoping Request on this matter, as a result the approach is taken as having been agreed.

13.1.4.2 Land Use Considerations

20. No aspect of the land use assessment was scoped out.

13.1.4.3 Socio-Economic Considerations

21. No aspect of the socio-economic assessment was scoped out.

13.2 Assessment Methodology

13.2.1 Legislation, Policy and Guidance

22. The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Energy, A Strategic Framework for Northern Ireland (2010), Department for Enterprise, Trade and Investment (DETI)[1];
- Building a Better Future, Regional Development Strategy for Northern Ireland 2035, Department for Regional Development[2];
- Everyone's Involved Sustainable Development Strategy (Northern Ireland Executive)[3];
- Sustainable Development Implementation Plan 2011 – 2014: Focus on the Future (Northern Ireland Executive)[4];
- Strategic Planning Policy Statement for Northern Ireland (SPPS): Planning for Sustainable Development (DoE)[5];
- Planning Policy Statement (PPS)16: Tourism (2013) (Do E)[6];
- PPS18: Renewable Energy (2009) (DoE)[7];
- PPS 21: Sustainable Development in the Countryside (2010)[8];
- The Northern Area Plan (2016) (DoE)[9];
- Causeway Coast and Glens Borough Local Development Plan 2030 – Tourism Topic Paper 14 [Draft] (Causeway Coasts and Glens Borough Council);[10]
- Causeway Coasts and Glens Borough Council Economic Strategy and Action Plan 2015 to 2018[11];
- Causeway Coasts and Glens Borough Council Loughgiel Village Plan (2018);[12]and
- Causeway Coasts and Glens Borough Council Cloughmills Village Plan (2018)[13].

13.2.1.1 Strategic Energy Framework (DETI)

23. The 2010 Strategic Energy Framework[1] (SEF) details Northern Ireland's energy future over the next ten years and illustrates the key energy goals in terms of building competitive markets, enhancing sustainability, ensuring security of supply and developing energy infrastructure. The SEF also confirms new and ambitious electricity and renewable targets including a 40% renewable electricity goal for 2020. Two key actions listed under the enhancing sustainability goal include:

- "*SEF 30: Promote and raise awareness of supply chain opportunities in sustainable energy technologies both locally and further afield;*
- *SEF 31: Support the growth of suitable manufacturing or tradeable service companies operating in the sustainable energy field*."

13.2.1.1.1 DETI – Envisioning the Future

24. In 2013, the Department for Enterprise, Trade and Investment (now replaced by the Department of the Economy) published a report[14] outlining different scenarios for Northern Ireland's energy system up to 2050 and how early decisions can affect its development.

25. The main conclusions of the report is that an ambitious reduction in greenhouse gas emissions would require:

- renewable electricity as the main form of electricity generation;
- a higher uptake of renewable heat;
- improved energy efficiency; and
- higher uptake of electric vehicles.

26. If these aims were to be achieved, this would reduce greenhouse gas emissions by 55% to 80%, while reducing fossil fuel imports from 96% of energy demand to 41% of energy demand in 2050. Further advances would be necessary, including increased deployment of renewable energy and a reinforced grid with integrated battery storage.

13.2.1.2 Shaping our Future, Regional Development Strategy for Northern Ireland 2035

27. The Regional Development Strategy[2] (RDS) sets out the framework for spatial development of the Region (Northern Ireland) up to 2035. The strategy aims to take account of the economic ambitions and needs of the Region, and put in place spatial planning, transport and housing priorities that will support and enable the aspirations of the Region to be met. Key policies of relevance to this Development include:

- RG5: Deliver a Sustainable and Secure Energy Supply;
- RG9: Deliver our Carbon Footprint and Facilitate Mitigation and Adaptation to Climate Change Whilst Improving Air Quality; and
- RG11: Conserve, Protect and, where possible, Enhance our Built Heritage and our Natural Environment.

[1] Department for Enterprise, Trade and Investment (DETI), 2010, Energy, A Strategic Framework for Northern Ireland, [Online]. Available at: https://www.economy-ni.gov.uk/sites/default/files/publications/deti/sef%202010.pdf

[2] Department for Regional Development, 2010, Building a Better Future, Regional Development Strategy for Northern Ireland 2035, [Online] Available at https://www.planningni.gov.uk/index/policy/rds2035.pdf
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[5] The Department of the Environment, September 2015. Strategic Planning Policy Statement for Northern Ireland (SPPS) [Online]. Available at: http://www.planningni.gov.uk/index/policy/spps_28_september_2015-3.pdf
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[13] Causeway Coast and Glens Borough Council Cloughmills Village Plan, June 2018 [online] available at https://www.causewaycoastandglens.gov.uk/work/regeneration/village-renewal
[14] DETI (2013), Envisioning the Future: Considering Energy in Northern Ireland to 2050

13.2.1.3 Strategic Planning Policy Statement for Northern Ireland (SPPS):

28. The SPPS for Northern Ireland[5] was published in September 2015 and contains PPS which set out the policies of the Department of the Environment on, in particular aspects of land use planning and apply to the whole of Northern Ireland.

29. PPS16: Tourism highlights the contribution tourism makes to the Northern Ireland economy in terms of revenues it generates, employment opportunities and the potential it creates for economic growth. PPS16 states that planning permission will not be granted for development that would in itself or in combination with existing and approved development in the locality have an adverse impact on a tourism asset such as to significantly comprise its tourism value. The supporting text states that a tourism asset is defined as any feature associated with the built or natural environment which is of intrinsic interest to tourists.

13.2.1.4 The Northern Area Plan 2016

30. On the 1st April 2015, the four councils of Ballymoney, Coleraine, Limavady and Moyle merged to form the new Causeway Coast and Glens Borough Council (the Council). The Northern Area Plan 2016[9] is currently the Local Development Plan (LDP) for the four legacy council areas until the Council adopts its own LDP (see **Section 13.2.5**). This Plan provides the broad land use planning framework however it does not contain any specific policies on wind energy or renewable energy developments. As detailed within the Northern Area Plan, the Project is located outside the Antrim Coasts and Glens AONB and any environmentally designated area.

13.2.1.5 Causeway Coast and Glens Local Development Plan 2030

31. As detailed in **Section 13.2.1.4**, the current LDP is the Northern Area Plan 2016 however the Council is currently in the preparatory stages of producing the LDP 2030[10] with the preferred options paper[15] published in June 2018. This includes preferred options for wind energy development and engagement in this process is recommended. The plan strategy is currently timetabled to be issued in autumn/winter 2019 for consultation and it is anticipated these will be adopted in summer/autumn 2021 after independent examination.

32. As part of the Preferred Options Report, a policy review was undertaken by the Council. From the review process, it was concluded that PPS 16: Tourism does not require any substantial change.

33. The Draft Local Policies Plan will be published for consultation in autumn 2022 and it is anticipated to be adopted in winter 2022. To date the following relevant Topic Papers have been presented to the Committee[16]:

- Population and Growth;
- Environment;
- Employment and Town Centres;
- Open Space, Sport and Outdoor Recreation;
- Housing;
- Countryside Pressure Analysis; and
- Tourism.

13.2.1.6 Causeway Coast and Glens Borough Council Economic Strategy and Action Plan 2015 to 2018

34. The Council's Economic Strategy[11] was published in April 2015 and discusses how it aims to build a strong economy. The report highlights a number of priorities including:

- Becoming more competitive and innovative;
- Expanding and developing the tourism sector;
- Developing business opportunities in growing areas such as the renewable energy sector, digital causeway, the knowledge industry and the agri-food sector; and
- Ensuring that local infrastructure meets business needs, including the development to reduce high electricity costs.

13.2.1.7 Causeway Coasts and Glens Borough Council Loughgiel Village Plan

35. The Village Plan was published in June 2018 and identifies six themes relevant to the Development of the village:

- Community development;
- Environment;
- Community service;
- Health and well-being;
- Tourism; and
- Good relations.

13.2.1.8 Causeway Coast and Glens Borough Council Cloughmills Village Plan

36. The Village Plan was published in June 2018 and five strategic themes were identified to develop the village:

- Community engagement;
- Environment and infrastructure;
- Communication and participation;
- Community health and well-being; and
- Local services.

13.2.2 Scoping Responses and Consultations

37. Consultation for this ES topic was undertaken with the organisations shown in **Table 13.1**.

Table 13.1: Consultation Responses

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Tourism NI	Scoping Response, 14/09/2017	Tourism NI does not provide comments on Scoping Requests or participate in pre-application discussions.	N/A
The Honourable The Irish Society	Scoping Response, 21/09/2017	The Society has no interests or rights within or adjacent to the Site.	N/A
Causeway Coasts and Glens Borough Council	Scoping Opinion, 28/2/2018	Any additional key sensitive receptors will have been identified by the consultees in their responses. The Council is not aware of any additional data sources to inform the socio- economic assessment.	N/A

13.2.3 Methodology for the Assessment of Effects

38. The significance of the potential effects of the Development has been classified by professional consideration of the sensitivity of the receptor and the magnitude of the potential effect. The methodology for the assessment of effects for this Chapter follows that detailed in **Chapter 2: EIA Methodology** of this ES. The potential types of effects, sensitivity, magnitude and significance criteria for the assessment of socio-economics, tourism and recreation and land use are provided below.

39. Effects on the tourism, recreation, land use and socio-economic resource can be described as direct, indirect or cumulative as outlined in **Table 13.2**. In addition, they are described as beneficial or adverse.

[15] Causeway Coast and Glens Borough Council, 2018. Local Development Plan Preferred Options Paper. [Online] Available at https://www.causewaycoastandglens.gov.uk/uploads/general/CCGBC_Local_Development_Plan_2030_-_POP.pdf Accessed 14/01/2019

[16] Causeway Coast and Glens Borough Council (2019). Development Plan (web page). Available at: https://www.causewaycoastandglens.gov.uk/live/planning/development-plan [accessed on 11/04/2019]

Table 13.2: Type of Effect

Type of Effect	Description
Direct Effect	For example: Jobs created during the decommissioning/construction, and operational phases of the Development. Physical disturbance to the land-use resource within the initial decommissioning/ construction stages, such as the footprint of the Development or decommissioning/construction activities impacting on any rights of access.
Indirect Effect	For example: Jobs created by the additional expenditure of wages into the local and wider economy and the purchasing of basic materials, equipment and office or accommodation space for staff as a result of the Development. Visual effects of the Development on viewpoints and users of nearby tourism and recreational receptors.
Cumulative Effect	Cumulative effects are those where the combined effect of two or more developments (be they operational or proposed) are of greater significance than those of the Development itself.

13.2.3.1 Sensitivity of Receptors

40. The sensitivity of the baseline conditions, including the importance of environmental features on or near to the Site or the sensitivity of potentially affected receptors, will be assessed in line with best practice guidance, legislation, statutory designations and / or professional judgement.

41. **Table 13.3** details the framework for determining the sensitivity of receptors.

Table 13.3: Framework for Determining Sensitivity of Receptors

Sensitivity of Receptor	Definition
Very High	Assets / receptors of international importance (e.g. European)
High	Assets / receptors of national importance (e.g. UK)
Medium	Assets / receptors of regional importance (e.g. Northern Ireland)
Low	Assets / receptors of local importance (e.g. Causeway Coast and Glens)
Negligible	Assets / receptors of negligible importance (e.g. a receptor that is not afforded protection under the Local Plan or other policy)

13.2.3.2 Magnitude of Effect

42. The magnitude of potential effects will be identified through consideration of the Development, the degree of change to baseline conditions predicted as a result of the Development, the duration and reversibility of an effect and professional judgement, best practice guidance and legislation.

43. The criteria for assessing the magnitude of an effect are presented in **Table 13.4**.

Table 13.4: Framework for Determining Magnitude of Effects

Magnitude of Effects	Definition
High	Total loss or major alteration of the socio-economic, land use, tourism or recreational asset / receptor.
Medium	Loss of, or alteration to, one or more key elements of the socio-economic, land use, tourism or recreational asset / receptor.
Low	Slight alteration of the socio-economic, land use, tourism or recreational asset / receptor.
Negligible	Barely, perceptible alteration of the socio-economic, land use, tourism or recreational asset / receptor.

13.2.3.3 Significance of Effect

44. The sensitivity of the asset and the magnitude of the predicted effects will be used as a guide, in addition to professional judgement, to predict the significance of the likely effects. **Table 13.5** summarises guideline criteria for assessing the significance of effects.

Table 13.5: Framework for Assessment of the Significance of Effects

Magnitude of Effect	Sensitivity of Receptor				
	Very High	High	Medium	Low	Negligible
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Minor	Negligible	Negligible	Negligible

45. Effects predicted to be of major or moderate significance are considered to be 'significant' in the context of the EIA Regulations, and are shaded in light green in the above table.

13.2.3.4 Assessment Limitations

46. Whilst efforts have been made to ensure that the key tourism and recreation facilities in the area have been identified through a combination of desk studies, site visits and consultation with key stakeholders such as the Council and The Honourable The Irish Society, it is possible that there are a number of small attractions that will not have been identified through the data collection process.

13.3 Baseline Survey Methodology

13.3.1 Tourism and Recreation Baseline Methodology

47. Tourism and recreation effects will be considered based on the guidance from Guidelines for Environmental Impact Assessment[17] and a Handbook for EIA[18] and consider:

- Tourism and recreation; and
- Public attitudes to wind farms.

48. The following sources of information have been used to inform the tourism and recreation baseline description set out in this Chapter:

- Causeway Coast and Glens Borough Council (www.causewaycoastandglens.gov.uk), and in particular:
- Discussion Paper 14: Tourism[19]; and
- Discussion Paper 7: Open Space, Sport and Outdoor Recreation[20];
- Tourism NI (www.tourismni.com);
- Walk NI (www.walkni.com); and

[17] Institute of Environmental Management and Assessment (IEMA) (2004) Guidelines for Environmental Impact Assessment.
[18] SNH (2003) A Handbook for Environmental Impact Assessment, Appendix 5: Guide to Outdoor Access Assessment.
[19] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper, Discussion Paper 14: Tourism. Available at: https://www.causewaycoastandglens.gov.uk/uploads/general/Discussion_Paper_14_-_Tourism.pdf [accessed on 15/02/2019].
[20] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper, Discussion Paper 7: Open Space, Sport and Outdoor Recreation. Available at: https://www.causewaycoastandglens.gov.uk/uploads/general/Discussion_Paper_7_-_Open_Space,_Sport_and_Outdoor_Recreation.pdf [accessed on 15/02/2019].

- Sustrans (Northern Ireland) (www.sustrans.org.uk/northern-ireland).

49. Information concerning the public's perception of windfarms has been gathered from studies undertaken across the UK and the Republic of Ireland.

13.3.2 Land Use Baseline Methodology

50. Baseline conditions have been established through desktop studies, including mapping and aerial imagery, and site visits (August 2017).

13.3.3 Socio-Economic Baseline Methodology

51. The following sources of information have been used to inform the socio-economic baseline description set out in this chapter:

- Northern Ireland Statistics and Research Agency (www.nisra.gov.uk);
- Department for the Economy Northern Ireland (www.economy-ni.gov.uk); and
- Office for National Statistics (www.ons.gov.uk).

52. Additionally, **Technical Appendix A13.1 Socio-Economic Assessment** has also been used.

13.4 Baseline Description

53. This section details information relating to tourism and recreation within the tourism and recreational study area, the current land use of the Site and the current socio-economic conditions within the socio-economic Study Areas.

13.4.1 Tourism and Recreation Baseline

54. The Causeway Coast and Glens area is the second most visited area after Belfast with almost 1.1 million overnight trips in 2017 which is equivalent to 21% of the total overnight trips made to Northern Ireland that year. Since 2011, the number of visitors to Causeway Coast and Glens has increased by 33%, compared to 23% growth in Northern Ireland as a whole.

55. The Development is located within a relatively remote setting with recreation opportunity based around the natural environment such as hills, lakes, rivers and forests. No recognised tourism or recreation resources are located within the Site Boundary.

56. Under The Access to the Countryside (Northern Ireland) Order 1983[21], public access is restricted to:

- Areas of land which are in public ownership and to which the public are invited to use;
- Public rights of way; or
- Where the public have the landowner's permission to visit.

57. In addition, in some areas of Northern Ireland, there is *de facto* access to open land. This means that the landowners tolerate access but, irrespective of the historic use of the land, there is no legal basis to the situation[22].

58. Many walking routes in the Causeway Coast and Glens are not formally designated public rights of way and access depends on the goodwill and tolerance of local landowners. There are no designated public rights of way or footpaths within 2 km of the Site.

59. The closest footpath to the Development is the Moyle Way, located approximately 3 km east of the Site in Slieveanorra Forest (see **Figure 13.2**). The Moyle Way is a 43 km long route which connects Ballycastle and Waterfoot and forms part of the Ulster Way. As a long-distance footpath, it is of regional importance (at the Northern Ireland level), and of medium sensitivity (see **Table 13.3**).

60. Lissanoure Castle and estate is a privately-owned castle which hosts weddings and events (see **Figure 13.2**) and has been extensively restored since 2000. Lissanoure Castle, which is designated as a Historic Park, Garden and Demesne, is located 3.6 km to the north-west of the Site Boundary. The Castle is important at the scale of Causeway Coast and Glens, it is not generally open to the public, and is therefore assessed as being of low sensitivity (see **Table 13.3**).

61. Altnahinch Reservoir, a 17.8 ha reservoir at the head of the River Bush, is a man-made asset utilised by NI Water and is available for brown trout and rainbow trout fishing subject to DAERA licencing and permitting[23]. Altnahinch Reservoir is located 1.5 km northeast of the Site Boundary. It is one of 20 locations identified by NI Direct[24] for angling in County Antrim, and hence is considered important at the Causeway Coast and Glens level, corresponding to a low sensitivity (see **Table 13.3**).

62. The Council's Discussion Paper 7: Open Space, Sport and Outdoor Recreation[25] focuses on children's play areas and sports pitches, which would not be affected by the Development and do not have the potential to receive effects from the Development, and are not considered further in this chapter.

63. There are no National Cycle Routes (NCR) within the Tourism and Recreation Study Area.

64. No other tourism and recreation receptors have been identified within the Tourism and Recreation Study Area.

65. There are notable tourist attractions in the region but outside the Tourism and Recreation Study Area. These include several filming locations within the Causeway Coast and Glens region that have been featured in the fantasy TV series 'Game of Thrones' including The Dark Hedges near Armoy, Cushendun and Ballintoy Harbour. The majority of the filming locations are located on the eastern and northern coastlines of Northern Ireland, at c. 20 km from the Site. The Dark Hedges, a tunnel-like avenue of intertwined beech trees, is located more inland, approximately 12 km north-east of the Site. Two of Northern Ireland's top 10 tourist attractions[26] are in Causeway Coast and Glens Borough: the Giant's Causeway and Carrick-a-Rede Rope Bridge. These are both c. 20 km from the Site with no visibility of the Development. As a result of being outside the Study Area and therefore too distant to receive significant effects, these are not considered further in the assessment.

66. The Council[42] identifies potential areas for the growth of tourism as being related to attractions on or near the coast. These are outside the Tourism and Recreation Study Area.

67. Visitor accommodation in the locality around the Site is limited with five B&Bs located within the Tourism and Recreation Study Area, the closest of which is Drumadoon B&B, located near Cloughmills, approximately 5.5 km south-west of the Site. Given the separation, visitors to these properties are highly unlikely to be substantially affected by a slight change in view, where such views are available, and effects on visitors at their accommodation and at the other B&Bs identified in this Study Area, would not be significant and are not considered further in this chapter.

13.4.1.1 Public Attitudes towards Windfarm Development

68. Existing studies into the attitudes of visitors, tourists and tourism organisations towards windfarms in the UK suggests that renewable energy schemes have their own tourism pull. Independent UK studies have shown that the adverse effects of windfarms on tourism are negligible, and there is a growing body of evidence to suggest that windfarms can become tourist attractions in their own right.

69. The most recent studies[27] regarding public attitudes to renewable energy has shown that support for renewable energy has remained high with 79% expressing support for the use of renewables. Opposition to renewables was very low at 4%, with

[21] The Access to the Countryside (Northern Ireland) Order 1983. Available online at: https://www.legislation.gov.uk/nisi/1983/1895 [Accessed on 22/09/2017]
[22] NIEA (Undated) Access to the Countryside – The Legal Position in Northern Ireland – Preliminary Note. Available online at: http://www.outdoorrecreationni.com/wp-content/uploads/2015/11/Access-to-the-Countryside_The-Legal-Position-in-Northern-Ireland_NIEA.docx+&cd=1&hl=en&ct=clnk&gl=uk [Accessed on 22/09/2017]
[23] NIDirect.gov.uk (2019). Angling at Altnahinch Reservoir. Available at: https://www.nidirect.gov.uk/articles/angling-altnahinch-reservoir [accessed on 16/02/19].
[24] NIDirect.gov.uk (2019). Angling at Altnahinch Reservoir. Available at: https://www.nidirect.gov.uk/articles/angling-altnahinch-reservoir [accessed on 16/02/19].

[25] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper, Discussion Paper 7: Open Space, Sport and Outdoor Recreation. Available at: https://www.causewaycoastandglens.gov.uk/uploads/general/Discussion_Paper_7_-_Open_Space,_Sport_and_Outdoor_Recreation.pdf [accessed on 15/02/2019].
[26] Causeway Coast and Glens Borough Council (2018). Local Development Plan 2030: Preferred Options Paper, Discussion Paper 14: Tourism. Available at: https://www.causewaycoastandglens.gov.uk/uploads/general/Discussion_Paper_14_-_Tourism.pdf [accessed on 15/02/2019].
[27] Department for Business, Energy and Industrial Strategy, May2017, Energy and Climate Change Public Attitude Tracker, Wave 21 [Online]. Available at: https://www.gov.uk/government/statistics/energy-and-climate-change-public-attitude-tracking-survey-wave-21

only 1% strongly opposed. 77% of respondents felt that renewable energy projects should provide direct benefits to the communities in which they are located, whilst 70% agreed that renewable industries and developments provide economic benefits to the UK. 58% said they would be happy to have a large-scale renewable development in their own area.

70. Interactions conducted omnibus research for The Irish Wind Energy Association[28] in 2017 as well as online research in November 2018 in order to measure and track perception and attitudes around wind power amongst Irish adults. In November 2018 83% of those surveyed were in favour of the use of wind power, with 15% neither favouring or opposing and only 2% strongly opposing the use of wind power. The specific benefit 'reduction in CO^2 emissions' was also recognised by over 4 in 5 Irish adults in 2018, versus 3 in 4 in 2017. That was closely followed by 'good for the environment' and 'cheaper electricity'. There was weaker recognition of employment benefits in 2018 versus 2017.

71. The potential for impact on tourism is closely linked to the perception of those visiting the area. A Northern Irish Tourism Board (NITB) survey undertaken in August 2011 concluded that tourists, on the whole, seem generally positive or neutral to the prospect of windfarm development and less than 5% of domestic (Northern Irish) tourists said they would be discouraged from returning to an area that had windfarms[29]. Research by VisitScotland in April 2012 observed that 80% of respondents said their decision on where to visit or stay in Scotland would not be affected by the presence of a windfarm[30]. In addition, 52% of all respondents disagreed that windfarms spoil the look of the UK/Scottish countryside, with a further 29% neither agreeing nor disagreeing.

72. This survey backs up a previous study commissioned by the Scottish Government in 2008 to investigate the economic impacts of windfarms on Scottish tourism[31]. This study found that three quarters of all respondents felt that windfarms had a positive or neutral impact on the landscape and that 68% of tourists reacted positively to the statement "*A well sited wind farm does not ruin landscape*". Furthermore, 93% of all visitors that had seen a windfarm during their visit to Scotland stated that this would not impact their intentions to return to Scotland for future holidays**Error! Bookmark not defined.**.

73. Likewise, research of visitor attitudes to windfarms in the Republic of Ireland observed that 47% of tourists consider that windfarms actually have a positive impact, and only 10% think they have very negative impacts[32].

74. A study by BiGGAR Economics[33] examined data to test if there was a correlation between the presence of windfarms in a particular area and tourism employment in that area. The report concluded, "*although this study does not suggest that there is any direct relationship between tourism sector growth and wind farm development, it does show that wind farms do not cause a decrease in tourism employment either at a local or a national level.*"

75. In a Public Local Inquiry for a Section 36 windfarm application at Harburnhead (reported in July 2014), West Lothian, in Scotland, the reporter concluded the following in relation to potential effects on tourism: *"If windfarms had a significant adverse impact on the number or experience of visitors, we would expect clear evidence of this by now."*[34]

76. Windfarms can be tourist attractions in themselves, providing additional interest in an area and a different experience that can complement other tourist experiences. The Best Practice Guidance to PPS18 acknowledges that wind energy developments can co-exist and potentially enhance tourism and leisure interests[7].

77. Rigged Hill Windfarm, located within the Causeway Coast and Glens Council area and also operated by ScottishPower Renewables, has incorporated the Ulster Way walking route onto its access tracks. Educational visits have been actively encouraged and hosted at the Operational Corkey Windfarm over a number years. RES has collated visitor numbers from these organised educational visits in relation to windfarm sites from 1995-2012 as part of the 2013 Meenamullen Wind farm ES[35]. During this period there were 924 visitors visiting the Operational Corkey Windfarm, compared with 7388 visitors to Elliots Hill Windfarm and 597 to Gruig Windfarm All visitors to the operational Corkey Windfarm were recorded from 1985 – 2007 with the highest numbers occurring in 1997 and 1998. No visitors have been recorded since 2007.

78. The Altahullion Windfarm, located c. 25 km west of the Development, has a dedicated tourist turbine, which is signposted from the main A6 Dungiven to Derry road on brown tourist signage, and which has received positive comments from walkers in the area[36]. It is included on the Park to Limavady Cycle Route, an 18-mile section of the NCN 93. The route passes the operational windfarm, and route guidance actively encourages users to "*get up close and personal with a turbine*[37]".

79. Altaveedan Windfarm regularly attracts interest from locals and visitors[38]. Educational visits are encouraged by the operator of the windfarm, and these aim to improve awareness of renewable energy and sustainable energy.

80. Elsewhere in Scotland, Whitelee Windfarm (operated by ScottishPower Renewables) regularly attracts walkers, runners, cyclists and horse riders to use its 130 km of trails on a daily basis, and has had over 735,000 visitors to its visitor centre since opening. The windfarm also hosts an annual trail running event ('Run the Blades') which offers three distances (10 km, half marathon and 50 km ultramarathon) and attracts over 500 participants[39]. There are also a wide range of other ranger-led events taking place on a regular basis within the windfarm, from children's summer clubs to weekly stroller walks[40].

81. The above evidence and studies highlight the varying opinions of visitors regarding wind energy development; however they suggest that the majority of those surveyed do not have negative attitudes towards windfarms and that windfarm sites are tourist destinations in their own right.

13.4.2 Land-Use Baseline

82. The Site is located on the western periphery of the Antrim Hills with the low-lying valley of the River Main to the west and the broader range of the Antrim Hills to the east. The Site is characterised by the steep upper slopes and distinctive ridgeline of Slievenahanaghan and its moorland land cover. The Site Boundary at the time of Scoping encloses approximately 330 hectares (ha) as set out in section 8.5.6 of **Chapter 8: Ecology and Fisheries**, of moorland habitat and incorporates the Operational Corkey Windfarm which has been operational on the Site since 1994.

83. The land use at the Site is upland agriculture (moorland and sheep grazing), which is of relatively low economic value and is commonplace in Northern Ireland. Environmental benefits are associated with areas of active bog within the Site, and effects on this as a receptor are assessed in **Chapter 8: Ecology and Fisheries**. The value of the land use at the Site is increased as a result of the Operational Corkey Windfarm, which, with a small land footprint, adds substantial economic and environmental value to the site. In combination, these three factors are assessed as leading to the land use at the Site being of importance at the Causeway Coast and Glens level, and hence of low sensitivity (see **Table 13.3**).

13.4.3 Local and Regional Socio-Economic Baseline

84. The Site is located approximately 18 km north of Ballymena in Co. Antrim, within the Causeway Coast and Glens Borough. The Borough Council was established on the 1st April 2015 and encompasses most of the northern coast of Northern Ireland and replaced Ballymoney Borough Council, Coleraine Borough Council, Limavady Borough Council and Moyle District Council.

85. The area within the Borough totals 2,796 km^2 and spans across Co. Antrim and Derry/Londonderry. Socio-economic and census data from 2014 indicates that there is a resident population of 142,303 in the Causeway Coast and Glens area[41]. Recent population growth in this area has been significantly lower than the Northern Ireland average, with an increase of 1.9%

[28]Interactions, IWEA Public Attitude Monitor 2018,Available Online at https://www.iwea.com/images/files/iwea-report-2018.pdf [accessed18/2/19]
[29] NITB (2011). Windfarms
[30] VisitScotland (2012) Wind Farm Consumer Research. Available online at: http://www.visitscotland.org/pdf/Windfarm%20Consumer%20Research%20final_docUpdatedx.pdf [Accessed on 26/09/2017]
[31] Glasgow Caledonian University, Moffat Centre and CogentSi (2008). The Economic Impacts of Wind Farms on Scottish Tourism. Available online at: http://www.gov.scot/Resource/Doc/214910/0057316.pdf [Accessed on 26/09/2017]
[32] Fáilte Ireland and Millward Brown Lansdowne (2012). Attitudes to Wind Farms in the Republic of Ireland Available online at: http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/4_Visitor_Insights/WindFarm-VAS-(FINAL)-(2).pdf?ext=.pdf [Accessed on 15/09/2017]
[33] BiGGAR Economics (2016). Wind Farms and Tourism Trends in Scotland. Available at: http://www.biggareconomics.co.uk/wp-content/uploads/2016/07/Research-Report-on-Wind-Farms-and-Tourism-in-Scotland-July-16.pdf [accessed on 16/02/2019].
[34] The Scottish Government, (2014), Harburnhead Wind Farm Decision Notice. Available online at: http://www.dpea.scotland.gov.uk/Document.aspx?id=206011 [Accessed on 15/09/2017]
[35] RES Group (2013). Chapter 19: Socio-Economic and Tourism Assessment.
[36] WalkNI.com (2019). Benbradagh. Available at: http://www.walkni.com/walks/172/benbradagh/ [accessed on 16/02/2019].
[37] Cycle N (2015) Park to Limavady. Available online at http://www.cycleni.com/61/park-to-limavady/
[38] RES (2019). Altaveedan Wind Farm Local Benefits. Available on http://www.altaveedan-windfarm.co.uk/benefits/
[39] http://www.breakingstrain.co.uk/run-the-blades/
[40] East Renfrewshire Council, Events Programme (Whitelee Ranger Service). Available online at: http://www.eastrenfrewshire.gov.uk/whitelee-events
[41] Invest Northern Ireland (2016) *Causeway Coast & Glens Council Area Profile.* Available online at: https://secure.investni.com/static/library/invest-ni/documents/a-mobile/council-area-profile-causeway-coast-and-glens.pdf [Accessed on 29/11/2017]

compared to 6.6%[42]. Currently, there is a 66% employment rate in the Causeway Coast and Glens area with 27% economically inactive. The largest employment sectors for the region includes distribution services, production and other services, with 12% of the population employed within the tourism trade[43]. In 2013, the energy sector in Northern Ireland employed 2,200 people and the number of energy sector enterprises has increased by 86% between 2010 and 2014[44].

86. Wholesale and retail employ the highest proportion of the Causeway Coast and Glens population at 20.6%, with the human health and social services sector employing 17.9%. Construction, which is associated with some windfarm contracts, employs 6.6% of the population in Causeway Coast and Glens compared to 4.6% nationally (see **Technical Appendix A13.1 Socio-Economic Assessment**).

13.4.4 Economic Value of the UK and Northern Ireland Renewables Industry

87. In 2017, businesses active in the UK low carbon and renewable energy (LCRE) economy generated £44.5 billion in turnover and employed an estimated 209,500 full-time equivalent (FTE) employees. This was an increase of 6.8% and 0.6% respectively when compared with 2016[45]. The LCRE economy accounted for around 1% of total UK non-financial turnover and employment in 2017, similar to 2016 and 2015 (Table 1). This figure is slightly higher for Wales, Scotland and Northern Ireland than England and the UK as a whole, suggesting that the LCRE economy is relatively more important in those regions.

Table 13.6 Low carbon and renewable energy economy, turnover and employment, UK and constituent countries, 2015 to 2017

	Low carbon and renewable energy economy			Percentage of total non-financial business economy activity		
	2015	2016	2017	2015	2016	2017
Turnover (£ billions)						
UK	40.4	41.7	44.5	1.3	1.3	1.2
England	32.4	32.6	35.6	1.2	1.1	1.1
Scotland	5.3	5.5	5.9	2.4	2.6	2.4
Wales	1.8	2.4	1.8	1.8	2.4	1.7
Northern Ireland	0.9	1.1	1.2	1.3	1.5	1.4
Employees UK (FTE)						
UK	202,200	208,300	209,500	0.9	0.9	0.9
England	165,300	165,100	173,000	0.8	0.8	0.8
Scotland	22,100	23,900	21,400	1.2	1.2	1.1
Wales	10,400	12,800	9,300	1.1	1.3	0.8
Northern Ireland	4,400	6,500	5,900	0.9	1.3	1.1

Source: Office for National Statistics - Low Carbon and Renewable Energy Economy Survey
Notes:

- Figures may not sum due to rounding. Regional estimates may not sum to UK totals where it was not possible to allocate activity to a region.
- The difference between the 2015, 2016 and 2017 estimates should be interpreted with caution due to the precision of survey-based estimates.
- Number of full-time equivalent (FTE) employees is rounded to the nearest 100, all other variables are rounded to the nearest £0.1 billion.

88. Turnover within the renewable energy sector grew by over 10% from £13.8 billion in 2016 to £15.3 billion in 2017. The onshore wind sector accounted for £2.8 billion (6.3% of UK LCRE) turnover and employed 5,300 (2.5% of UK LCRE) FTEs in 2017.

89. Investment in energy infrastructure and an aim to meet the renewable energy target of 40% from renewable sources by 2020 are key themes that occur in the strategic economic, environmental and energy policy context documents for Northern Ireland. The drive towards generating more energy from renewable sources is a key policy theme which is supported within the wider planning policy guidance.

90. The Northern Ireland Economic Strategy[46] sets out Northern Irelands priorities for sustainable growth and prosperity up to the year 2030. Energy infrastructure is one of the types of economic infrastructure highlighted as helping to achieve this. A Revised Economic Strategy was published in 2016 and draws attention to the need for green sustainable growth to ensure that resources are available for future generations.

91. The Strategic Energy Framework[47] outlines Northern Ireland's direction for energy policy. Onshore wind is recognised as the most established source of renewable energy in Northern Ireland. It recognises Northern Ireland's dependence on imported fossil fuels to meet energy needs which impacts the security of the supply. The Department of Enterprise, Trade and Investment (DETI) has established the aim of developing a more secure and sustainable energy system where:

- Energy is as competitively priced as possible alongside robust security of supply;
- Much more energy is secured from renewable sources and the resulting economic opportunities are fully exploited; and
- Energy efficiency is maximised.

92. To achieve this a target of 40% of electricity from renewable sources by 2020 has been set, but is clear that an updated Energy Strategy is required to look beyond 2020. DETI produced a report in 2013 titled Envisioning the Future: Considering Energy in Northern Ireland[48] to 2050 which details a vision for energy supply in Northern Ireland up to 2050. The Vision builds on the SEF and determines what can be achieved by 2050 and what early decision need to made to support the 2050 vision. The scenarios produced in the report envisage that greenhouse gas emissions will be reduced by 55% to 80% by 2050 and that Northern Ireland will become a net exporter of energy.

93. NIRIG, the industry body for the renewables sector in Northern Ireland, published its energy strategy in 2018[49], setting out a vision for Northern Ireland's continued economic growth utilising sustainable, low carbon, low-cost electricity generation from resources such as onshore wind, solar and storage.

94. NIRIG have also published a vision for energy in 2050[50], which sets targets for energy generation:

- 40x20 – 40% of electricity from renewable sources by 2020, increasing from 35% currently;
- 70x30 – renewable sources provide 70% of electricity. This would include 2.2GW of onshore wind, 400MW of solar generation, 200,00 electric vehicles, 117,00 heat pumps and 340MW of battery storage; and
- 100x50 – a fully decarbonised energy sector by 2050, with a diverse energy mix, competitive markets, maximised low-carbon generation and energy efficiency measures.

[42] Causeway Coasts and Glens Borough Council (2015) Discussion Paper 1: Population and Growth. Available online at: https://www.causewaycoastandglens.gov.uk/uploads/general/Topic_Paper_1_-_Population_and_Growth.pdf [Accessed on 05/07/2017]
[43] Invest Northern Ireland (2016) *Causeway Coast & Glens Council Area Profile.* Available online at: https://secure.investni.com/static/library/invest-ni/documents/a-desktop/council-area-profile-causeway-coast-and-glens.pdf [Accessed on 05/07/2017]
[44] Department of Enterprise, Trade and Investment (2016) *Energy in Northern Ireland 2016*. Available online at: https://www.economy-ni.gov.uk/sites/default/files/publications/deti/energy-northern-ireland-2016.pdf [Accessed on 05/07/2017]
[45] Office for National Statistics, Jan 2019, Low Carbon and Renewable Energy Economy, UK: 2017, Available at https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2017, [accessed 02/04/19]
[46] Northern Ireland Executive (2012), Economic Strategy: Priorities for sustainable growth and prosperity [online] available at https://www.northernireland.gov.uk/sites/default/files/publications/nigov/ni-economic-strategy-revised-130312_0.pdf
[47] Department of Enterprise, Trade and Investment (2010), Strategic Energy Framework for Northern Ireland. [online] available at https://www.economy-ni.gov.uk/publications/energy-strategic-framework-northern-ireland
[48] DETI (2013) Envisioning the Future: Considering Energy in Northern Ireland Available at https://www.nienvironmentlink.org/cmsfiles/policy-hub/files/documentation/Energy/2050_main_report_-_final_version.pdf [Accessed 09/05/2019]
[49] NIRIG (2018), Energy Strategy for Northern Ireland.
[50] NIRIG (2018), Energy Vision

95. A report by Baringa, which considered the costs and benefits to consumers of wind energy in Northern Ireland[51], found that there was a net benefit to consumers between 2000 and 2020 as a result of increased deployment of wind energy. The report concluded that the deployment of 1.4 GW of wind generation capacity in Northern Ireland between 2000 and 2020 will result in a total net benefit to consumers, over 20 years, of £0.1bn (£135 million to be exact), which equates to a net benefit of about £4 per person per year.

96. To date in Northern Ireland SPR operates 5 onshore windfarms and 1 offshore windfarm within the Irish Sea. The West of Duddon Sands offshore windfarm enabled the construction of a £50 million bespoke wind installation and pre-assembly facility at Belfast Harbour, supporting hundreds of jobs. Similarly, Lamprell based out of the Harland and Wolff facility were able to secure a foundations contract worth £30 million as part of the East Anglia One offshore windfarm, demonstrating that SPR and renewable deployment has made a positive impact on the Northern Irish economy to date.

97. SPR aims to ensure that local communities benefit from their windfarm developments. Through its presence in Northern Ireland, and partly through Operational Corkey Windfarm SPR has provided £239,357 of funding to local primary schools and other organisations. This has supported a range of projects, such as improving community centre accessibility, sponsoring local youth group activities and creating a sensory garden for a playgroup.

98. Currently the Operational Corkey Windfarm also currently makes lease payments to the landowner for the land. This local financial input may be spent locally or otherwise.

99. The Operational Corkey Windfarm also pays business rates. In Northern Ireland, business rates consist of two elements[52]. The regional rate is typically set by the Northern Ireland Executive, and these payments are received by the Executive. The district rate is set by Causeway Coast and Glens Borough Council, and these payments are received by the Council.

13.5 Embedded Mitigation

100. Embedded mitigation includes measures embodied in the design of the Development to eliminate or reduce adverse effects that would otherwise occur. These are set out in **Chapter 4: Site Selection and Design**.

13.5.1 Tourism and Recreation Mitigation

101. As there are no tourism resources identified within the Site Boundary potential effects on tourism and recreation arising from the Development are solely indirect, as a result of changes to the visual environment. A coherent design has sought to minimise such effects, as set out in **Chapter 4** and **Chapter 6: Landscape and Visual**.

13.5.2 Land Use Mitigation

102. Potential effects on land use arise as a result of the footprint of the Development. As set out in **Chapter 4**, the infrastructure of the Operational Corkey Windfarm has been proposed to be re-used wherever possible, to minimise additional land-take from the Development. In addition, **Technical Appendix 3.2 Draft Habitat Management Plan** sets out how the restoration of habitats will be carried out for land used by the Operational Corkey Windfarm that cannot be re-used for the Development.

13.5.3 Socio-economic Mitigation

103. Potential economic effects of the Development are beneficial, and arise as a result of the initial decommissioning / construction, and operational phase employment, direct contributions to the local economy in the form of for example business rates and land lease payments, alongside contributing towards lowering the levelised cost of electricity to the consumer and contributing to low carbon economy policy goals. Embedded mitigation (enhancement) of these effects arises as a direct result of the Development itself increasing the output of the site from 5MW to 20MW,through maximising the Site's generation capacity, when compared to the Operational Corkey Windfarm with the potential to increase this by four times. The design process outlined in **Chapter 4** sought to balance environmental effects and generation capacity, to maximise generation capacity and associated economic benefits, where this would not lead to unacceptable adverse environmental effects.

13.6 Assessment of Potential Effects

104. The effects arising from the Development have been considered during its initial decommissioning/construction and operational phases. Effects occurring during the initial decommissioning/construction phases would be short term effects, and those occurring as a result of the operational phase of the Development would be permanent effects that would be reversible should the Development be decommissioned.

13.6.1 Potential Decommissioning and Construction Effects

13.6.1.1 Tourism and Recreation Effects

105. This assessment will investigate potential decommissioning and construction effects of the Development on the tourism and recreational receptors. Recreational amenity encompasses a range of experiential factors, including visual pleasure, a sense of space, exercise, fresh air, light, company or solitude, tranquillity, appreciating wildlife and other factors, which may include subjective factors. It is not necessarily the case that a significant visual effect (or other type of effect) leads to a significant recreational amenity effect, although it may, and this is considered in the assessments.

106. The closest footpath, the Moyle Way, at 3 km east of the Site, is part of a long-distance footpath. It would not be affected directly during the initial decommissioning/construction phase, i.e., no construction works would take place along it. Additionally, this footpath would not be substantially affected indirectly during the decommissioning/construction phase. Given the intervening distance between the Development and the receptor, and the surrounding Sileveanorra Forest for much of the path, views of local construction activity and construction noise would be unlikely to occur. Visual effects of the proposed turbines, as they are erected, on the footpath are fully assessed in **Chapter 6: Landscape and Visual**, section 6.8.24, and assessed as being of medium magnitude. Given the visual effects on parts of this path at a distance of c. 4 - 7 km (outside the forested area), and that no other aspects of the walking experience would be affected, the overall change in walking experience along the path is assessed as being of negligible magnitude (see **Table 13.4**). The recreational amenity of users of this receptor is influenced by many factors in addition to visual amenity, however, including fresh air, a feeling of space, exercise, company, etc., and none of these factors would be affected in any way by the Development. As such, initial decommissioning/construction effects on this path would be negligible (see **Table 13.5**) which is not significant in terms of the EIA Regulations. No other potential indirect effects in relation to other topic areas are anticipated, which could influence the recreational amenity of the Moyle Way.

107. Lissanoure Castle and Gardens is a venue for weddings and parties it is not open to members of the public as a tourist attraction. As the castle is located approximately 3.6 km from the Development, there would be no direct effects. The landscape park incorporates a lake, farmland, shelterbelts and woodland, though visitors would spend the majority of their time at the main buildings. The property contains and is largely surrounded by mature trees, and views south-east towards the Development are generally limited to glimpsed views from the north-western shores of the small lake within the grounds.

108. Access to the Castle falls on the traffic route to Site, as outlined within **Chapter 12: Access and Traffic**. As a result, during the temporary decommissioning/construction visitors to the Castle may experience slightly increased traffic levels on the A44 and Ballyweeny Road, two roads important for visiting and gaining access to the castle. Traffic effects would not occur from 13:00 on Saturday until Monday mornings, because of construction timings and construction traffic timings (see **Chapter 12: Access and Traffic**). The decommissioning/construction phase is expected to last for approximately 8 months, therefore traffic effects of a temporary minor magnitude would be experienced for visitors to the Castle in both directions during this 8-month period. The change in experience of visiting the Castle associated with increased traffic along the A44 and/or Ballyweeny Road would be of negligible magnitude.

109. Changes in the visual aspects of the experience of visiting the Castle associated with the erection of new turbines as the construction of the Development progresses have been assessed on both the Landscape and Visual Assessment and the Cultural Heritage Assessment (see **Chapter 6, section 6.7.16** and **Chapter 11, section 11.5.2**). This is assessed as a change of negligible magnitude (see **Table 13.4**) on the experience of visiting the Castle. Overall, recreational amenity effects during decommissioning/construction phases of the Development on visitors to the Castle would be negligible (see **Table 13.5**), and not significant in terms of the EIA Regulations.

110. Altnahinch Reservoir is a manmade asset subject to Northern Ireland Water activity and can be used by anglers for fishing from the shore and from boats. Located 1.5 km from the Site, it would not receive any direct effects from the decommissioning/construction phase of the Development. Indirect effects would be associated principally with the changes to views, as the Operational Corkey Windfarm turbines are removed, and the new turbines are erected. Visual effects on the reservoir are assessed in **Chapter 6: Landscape and Visual**, section 6.8.6. Slievenahanaghan Hill would form a screen to

[51] Baringa (2019), The Wind Dividend: How wind energy pays back to Northern Ireland.

[52] Northern Ireland Assembly Commission (2019). What are rates and why do we pay them? Available at: https://www.assemblyresearchmatters.org/2018/03/22/what-are-rates-and-why-do-we-pay-them/ [accessed on 16/02/2019].

much of the infrastructure associated with the decommissioning of Operational Corkey Windfarm and construction of the Development. The most apparent features during these stages would be the use of tall cranes and the presence of turbines in various states of decommissioning and construction. The magnitude of change during the combined decommissioning and construction would be high largely owing to the proximity of these features and their elevated position above the reservoir. It is possible that when there are light winds from the west, decommissioning/construction noise may be audible at times, though this would be restricted to the construction working hours (i.e., not after 19:00 on weekdays, and excluding weekends from 13:00 Saturday), and be controlled to meet acceptable recognised limits. Overall, the potential effects on recreational amenity are assessed as low (see **Table 13.4**), which, when combined with the low sensitivity, leads to a negligible effect (see **Table 13.5**) that is not significant in terms of the EIA Regulations.

13.6.1.2 Land-Use Effects

111. During the initial decommissioning/construction phases, the principal land use at the Site would change to be a construction site. Actual decommissioning/construction work would be localised to the existing and proposed infrastructure, with the majority of the Land-Use Study Area remaining as upland agriculture (moorland). It is expected that sheep would cease to be grazed within the more immediate surrounds of the Land-Use Study Area, for health and safety reasons. The Operational Corkey Windfarm would be removed, and replaced with the new Development infrastructure and turbines. The footprint of the infrastructure would increase temporarily, before the habitat management provisions outlined in **Technical Appendix A3.2 Draft Habitat Management Plan** were implemented and became effective in restoring to vegetated habitat those aspects of former infrastructure not required for the Development and its future operation and maintenance.

112. Changes to land use within the Site during the initial decommissioning/construction phases would be of medium magnitude (see **Table 13.4**), albeit temporary. Combined with a low sensitivity receptor, the land use effects would be minor (see **Table 13.5**) and not significant in terms of the EIA Regulations.

13.6.1.3 Economic Benefits

13.6.1.3.1 Direct Benefits

113. SPR will hold a series of meet-the-buyer events as early as possible, allowing local contractors to learn about opportunities to bid for contracts, and time to upskill prior to any tender process. SPR has significant experience in organising these types of events and has a good understanding of the local area's capacity given that it currently operates Corkey Windfarm.

114. Where possible training and support for local businesses can be organised to increase their capacity to bid. SPR can work and encourage the main infrastructure contractor to work with partners such as the Department for Energy and the Northern Regional College, which has branches in Ballymoney, Coleraine and Ballymena.

115. In addition, SPR can via their technical evaluation during a tender process, give additional weight to primary contractors that show a commitment to increasing local content in their supply chains. An auditing process could also be undertaken so that the amount of local content sources during the initial decommissioning/construction phase is recorded.

116. As described in **Technical Appendix A13.1Socio-Economic Assessment,** the economic impact assessment has been undertaken on the basis of 5 turbines with c. 4MW of generating capacity each, with total generating capacity of c. 20MW. The average expenditure on the construction and development of windfarms can be estimated based on the average spend per MW, the average spend per turbine, or a combination of the two, as appropriate.

117. Employment opportunities that may be available for local contractors include:

- Development and planning;
- Balance of plant;
- Turbines; and
- Grid connection.

118. The economic impact of the initial development and decommissioning/ construction phases was estimated for the socio-economic study areas. In order to do this, it was necessary to estimate the proportion of each type of contract that might be secured in each of these two Study Areas. Research by BiGGAR Economics[53] into windfarms that are currently operating found that the largest proportion of capital expenditure was on turbine related contracts (64%), followed by balance of plant (16%), grid connection (12%) and development and planning (8%). To estimate the expenditure for each contract in each of the Study Areas these percentages were applied to the estimated size of each component contract. The assumptions were based on the average from the NIRIG research, analysis of the industries and professions in each of the Study Areas, BiGGAR Economics previous experience and information provided by the developer.

119. It was estimated that Causeway Coast and Glens could secure contracts worth £1.5 million which is equivalent to 7% of capital expenditure. It is considered that this represents a temporary effect of minor positive significance to the Local Study Area.

120. It was estimated that Northern Ireland as a whole could secure contracts worth £6.4 million which is equivalent to 29% of capital expenditure associated with these phases of the Development. It is considered that this represents a temporary effect of minor positive significance to the Regional Study Area.

121. The employment effects during the initial development and decommissioning/construction phases are reported in job years rather than Full-time equivalents (FTE's) because the contracts would be short term. It is anticipated that the initial development and decommissioning construction phases would support 11 job years in Local Study Area and 45 job years within the Regional Study Area (Northern Ireland level). Given the high levels of unemployment at the Borough level and in Northern Ireland, this represents a temporary, beneficial effect of minor significance to the Local and Regional Study Area.

13.6.1.3.2 Indirect Benefits

122. It is likely that those who benefit from direct employment during the development phase and the initial decommissioning / construction phases of the Development, will have an indirect benefit on the wider economy when they spend their salaries. Research undertaken by RenewableUK in 2012[54] found that the average salary for employees in the onshore wind sector is £34,600. It was therefore estimated that £0.4 million would be paid to staff directly employed during the development, and initial decommissioning/construction phases of the Development in Causeway Coast and Glens and £1.6 million would be paid in salaries throughout Northern Ireland. Assumptions were made regarding the location of employee expenditure. It was assumed that employees that live in Causeway Coast and Glens would spend 40% of their salaries in the Local Government District (LGD), and workers living in the rest of Northern Ireland would spend 74% of their salaries in Northern Ireland.

123. The economic impact of this increase in expenditure was estimated using the average Gross Value Added (GVA)/turnover and turnover/employee for the whole economy as reported in the Annual Business Survey[55]. In this way it was possible to estimate the induced impact direct employees would create during the development and initial decommissioning/ construction phases. It was estimated that direct employees would spend £0.4 million in Causeway Coast and Glens, supporting around £0.1 million GVA and 1 job. In Northern Ireland, direct employees could spend £1.6 million, supporting £0.4 million GVA and 7jobs. It is considered that this represents a temporary, beneficial effect of minor significance to the Local and Regional Study Areas.

124. The total impact during the development and initial decommissioning/construction phases is the sum of direct impacts and indirect impacts from expenditure of direct employees. The total combined impact is estimated to be £1.5 million and 12 job-years in Causeway Coast and Glens, and £6.7 million and 52 job years in Northern Ireland. It is considered that this represents a temporary effect of minor positive significance to the Local and Regional Study Areas.

13.6.2 Potential Operational Phase Effects

13.6.2.1 Tourism and Recreation Effects

125. There would be no direct effects on the Moyle Way during the operational phase. The footpath will not be substantially affected indirectly during the operational phase. Given the intervening distance between the Development and the receptor, and the surrounding Sileveanorra Forest for much of the path, views of the turbines and wind turbine noise are unlikely to occur for substantial sections of the path. Visual effects of the proposed turbines from the footpath are fully assessed in **Chapter 6: Landscape and Visual**, section 6.8.24, which concludes the effects are of medium magnitude. The recreational amenity of users of these receptor locations is influenced by many factors in addition to visual amenity, however, including fresh air, a feeling of space, exercise, company, etc., and none of these factors would be affected in any way by the Development. Given the visual effects on parts of this path at a distance of c. 4 – 7 km (outside the forested area), and that no other aspects of the walking experience would be affected, the overall change in walking experience along the path is

[53] BiGGAR Economics (2015), Onshore Wind: Economic Benefits in Northern Ireland
[54] Department of Energy and Climate Change, RenewableUK (2012), Onshore Wind: Direct and Wider Economic Impacts
[55] Office for National Statistics (2018), Annual Business Survey 2017 Provisional

assessed as being of negligible magnitude (see **Table 13.4**). As such, operational effects on this path would be negligible (see **Table 13.5**) which is not significant in terms of the EIA Regulations.

126. Lissanoure Castle and Gardens is located approximately 3.6 km from the Development, so there would be no direct effects. The landscape park incorporates a lake, farmland, shelterbelts and woodland, though visitors would spend the majority of their time at the main buildings. The Development remains largely screened from within the grounds of the estate. There may be intermittent visibility of the Development in glimpsed views towards the hills to the east, from the eastern estate boundary; however, this upland landscape context is characterised by existing windfarm sites with the Operational Corkey Windfarm, Gruig Windfarm and Altaveedan Windfarm visible as well as the single turbines along Reservoir Road and Gruig Lane. The Development would replace the Operational Corkey Windfarm and would be seen in context of the adjacent operational Gruig Windfarm to the south and Altaveedan to the north. Whilst the Development would consist of taller turbines, it would be seen within the distant upland context in which turbines are already sited. As such, the change in landscape context to the east of the park would be slight, consisting of taller turbines visible above a ridgeline in views that already contain other wind turbines. This is assessed as a change of negligible magnitude (see **Table 13.4**) on the experience of visiting the Castle and its gardens. Overall, recreational amenity effects during operation of the Development on visitors to the Castle would be negligible (see **Table 13.5**), and not significant in terms of the EIA Regulations.

127. Altnahinch Reservoir is located 1.5 km from the Site at its closest point, so it would not receive any direct effects from the operational phase of the Development. Indirect effects would be associated principally with the views of the new wind turbines, replacing the existing views of the Operational Corkey Windfarm turbines. Visual effects of the proposed turbines from the footpath are fully assessed in **Chapter 6: Landscape and Visual**, section 6.8.6, which concludes the effects are of high magnitude. The recreational amenity of users of this receptor location is influenced by many factors in addition to visual amenity, however, including fresh air, a feeling of space, exercise, company, etc., and none of these factors would be affected in any way by the Development An operational noise assessment has been undertaken in chapter 10: Noise. The operational noise assessment has concluded that operational noise limits will be met. This receptor lies at more than 1.5 km from the Site at its closed point. Overall, the potential effects on recreational amenity are assessed as low (see **Table 13.4**), which, when combined with the low sensitivity of this receptor, leads to a negligible effect (see **Table 13.5**) that is not significant in terms of the EIA Regulations.

13.6.2.2 Land-Use Effects

128. During the operational phase, the land use at the site would change, relative to the baseline, which currently contains the Operational Corkey Windfarm. This will involve a change from 10 smaller turbines and associated infrastructure, to 5 larger turbines and associated infrastructure. The footprint of the Development will increase overall by approximately 8 ha including earthworks and temporary construction compounds which will be re-instated (where these are not required for future operational maintenance purposes) following the initial decommissioning / construction phases. The uses of the Site apart from renewables, for active peat and upland agriculture, will continue essentially as per the baseline scenario. This would be of a negligible magnitude (see **Table 13.4**) given that much of the existing infrastructure will be re-used. The value of the land would increase substantially relative to the baseline, as a result of the increased capacity of the repowered windfarm adding to the diversification, low carbon, and sustainable future of the Site. This would lead to a beneficial change of medium magnitude (see **Table 13.4**).

129. Changes to land use within the site during the operational phase would be of a beneficial and medium magnitude, permanent and reversible if the Development were to be decommissioned in the future. Combined with a low sensitivity, the land use effects would be beneficial and minor (see **Table 13.5**) and not significant in terms of the EIA Regulations.

13.6.2.3 Economic Benefits

13.6.2.3.1 Direct Benefits

130. Once operational, the Development will require routine maintenance and servicing. Expenditure on operations and maintenance was estimated based on analysis undertaken in the NIRIG report[56]. Overall taking account of both direct and indirect effects, it was estimated that the annual operations and maintenance expenditure associated with the Development could be up to £0.6 million per annum. As an illustration of the effect over time, after 30 years this could amount to £19.1 million.

131. To estimate the economic impact of the operation and maintenance phase it was first necessary to estimate the proportion of contracts that could be secured in each of the Study Areas (Local and Regional). These assumptions were based on the contract proportions reported in the NIRIG, analysis of the industries present in each of the study areas and existing arrangements. It is estimated that the Causeway Coast and Glens area (Local Study Area) could secure 38% of operation and maintenance contracts worth £0.2 million annually and £7.3 million over an illustrative30 year period. In Northern Ireland (Regional Study Area) as a whole, it was estimated that it could secure 53% of contracts, worth £0.3 million annually and £10.1 million over a 30 year illustrative period. It is considered that this represents a permanent, but reversible effect of minor positive significance to the Local and Regional Study Areas.

132. As with the initial decommissioning and construction phases, the contract values awarded in each of the defined Study Areas represents an increase in turnover in those areas. It is estimated that turnover generated by the operation and maintenance could support 2 jobs in Causeway Coast and Glens and 2 jobs in Northern Ireland. It is considered that this represents a permanent but reversible effect of minor positive significance to the Local and Regional Study Areas.

133. In addition to land owner rents, the Development would be liable for non-domestic rates, the payment of which would contribute to public sector finances. It is estimated that the Development could contribute £0.3 million annually to public finances. Over a 30 year period this would be expected to contribute £9.4 million, although the actual contribution would depend on variables such as the actual load factor of the Development.

13.6.2.3.2 Indirect Benefits

134. As with initial decommissioning and construction expenditure, those directly employed during the operation and maintenance phase will have a wider benefit on the economy by spending their salary. This was estimated in the same way as for the initial decommissioning and construction phases. Adding together the direct and induced impacts from the spending of direct employees during the operation and maintenance it was estimated that the total impact would be £0.3 million and 2 jobs in the Local Study Area, and £0.4 million and 3 jobs in the Regional Study Area.. Over an illustrative period of 30 years, the economic impact would be £7.5 million in the Local Study Area and £10.6 million in the Regional Study Area. It is considered that this represents a permanent but reversible effect of minor positive significance to the Local and Regional Study Areas.

135. SPR intends to provide a package of benefits to the community which will be in line with industry best practice. For the purpose of the assessment, it has been assumed that the value of the community benefit package will equate to £1,000 per MW of installed capacity per year. As the Development is expected to have an installed capacity of c. 20 MW, the annual contribution to the fund will be up to £20,000 which equates to £0.6 million over an illustrative period of 30 years. The actual value of the community package, its shape, and means of administration of the community fund will be discussed and agreed with the local community, dialogue is ongoing. Subject to an administrative community function being in place, this will be formalised, nearer to the time of decommissioning/ construction commencing.

136. In mid-2018 Loughgiel[57] and Cloughmills[58] published their village plans, which set out the aspirations of the villages as well specific actions that can be taken to achieve them. These include:

- building and refurbishing community facilities, including sports facilities that can be used by younger people, families and older people;
- expanded village infrastructure, including pathways and lighting, to improve health and wellbeing outcomes, and signage and a website to improve tourism appeal; and
- develop and expand services to the community, such as a handyman service for the elderly and adult education classes.

137. These projects each require various levels of initial or ongoing funding. The community benefit package could be used to support these projects.

[56] Biggar Economics (2015). The impact of the onshore wind sector in Northern Ireland on behalf on NI-RIG.
[57] Causeway Coast and Glens Borough Council Loughgiel Village Plan, June 2018, [online] available at https://www.causewaycoastandglens.gov.uk/work/regeneration/village-renewal

[58] Causeway Coast and Glens Borough Council Cloughmills Village Plan, June 2018 [online] available at https://www.causewaycoastandglens.gov.uk/work/regeneration/village-renewal

13.7 Mitigation and Residual Effects

138. No direct effects are predicted upon any features of tourism or recreational value during the initial decommissioning/construction or operational phases of the Development. No mitigation for the negligible, indirect effects on tourism and recreational receptors is proposed.

139. Mitigation (including for ecological net gain) for land use effects has been embedded into the scheme, including the habitat management provisions outlined within **Technical Appendix 3.2 Draft Habitat Management Plan** , as set out in **Section 13.5**, and no further mitigation is proposed.

140. No further mitigation or enhancement is proposed for the beneficial economic effects associated with the Development.

141. Given that no mitigation is proposed beyond that embedded into the Development design, as set out in **Chapter 3 &4** and **section 13.5 of this chapter**, the residual effects are the same as described in **section 13.6**, above.

13.8 Cumulative Effect Assessment

142. This assessment considers the potential for significant effects to occur on relevant receptors when considering adding the Development to a cumulative baseline comprising the current baseline, plus other consented, but not built, windfarm developments and windfarm developments for which a valid planning application has been submitted.

13.8.1 Tourism and Recreation Cumulative Effect

143. **Table 13.8** details the windfarms included within the tourism and recreational cumulative assessment. As the wider Tourism and Recreational Study Area extends to 10 km from the Site, those windfarms within 20 km were included as part of the cumulative search area. Single turbines were excluded as they are unlikely to have a cumulative effect on tourism and recreational receptors.

Table 13.8: Windfarms considered in Tourism and Recreational Cumulative Assessment

Windfarm	Status	No of Turbines	Distance from the Closest Development Turbine (km)
Altaveedan	Operational	9	3.9 km
Gruig	Operational	10	0.7 km
Armoy	Refused – at Appeal	6	8.7 km
Ballymena	Operational	2	17.1 km
Cloonty	Operational	4	18.7 km
Elginny Hill	Operational	10	11.2 km
Garves	Operational	5	11.4 km
Glenbuck II	Operational	3	11.3 km
Long Mountain	Operational	12	10.8 km
Rathsherry	Operational	9	10.4 km
Coolkeeran Road (134)	Operational	2	4.9 km
Carnalbanagh	Application	7	19.1 km

144. The cumulative visual effects of the Development are assessed in **Chapter 6: Landscape and Visual Impact Assessment**, section 6.5.6 and assessed as being of medium magnitude**.** The cumulative viewpoints related to the tourism and recreational receptors are Viewpoint 6: Altnahinch Reservoir and the Moyle Way which are assessed as having a medium magnitude. The recreational amenity of users of these receptor locations is influenced by many factors in addition to visual amenity, including fresh air, a feeling of space, exercise, company, etc., and none of these factors would be affected in any way by the Development or the addition of any other application stage windfarms to the baseline.

145. All effects on the tourism and recreational receptors were assessed as negligible, because of the very low levels of change which would result from the Development, and the addition of any other application stage windfarm sites to the baseline is not expected to alter this position. The Development alongside other cumulative developments will not prevent people from visiting the nearby tourism and recreational receptors and it should be noted that the effects of changes to viewpoints are subjective. Therefore, any cumulative effects of the Development in combination with these other developments on the tourism and recreational receptors during the initial decommissioning /construction phases of the Development would be short term and reversible and considered to be a negligible cumulative effect. Any cumulative effects of the Development in combination with these other developments on the tourism and recreational receptors during the operational phase of the Development would be permanent and reversible and considered to be a negligible cumulative effect.

13.8.2 Land Use Cumulative Effect

146. The additional effect of the Development to the cumulative baseline on land use is assessed as negligible given the comparative size of the wider 10 km Study Area, and the common occurrence of such land within this Study Area (noting that effects on active peat are assessed in **Chapter 8: Ecology**) compared to the actual land take of the Development.

13.8.3 Socio-Economic Cumulative Effect

147. This section considers the cumulative effects on direct employment opportunities and economic benefits, which would arise from the initial decommissioning/construction and operation phases of the Development in conjunction with windfarms within 30km of the Site Boundary (as identified in **Chapter 6**) of which there are 53 at the cumulative 'cut-off date' of 20th May 2019. The status of these schemes at the time of the assessment is shown in **Table 13.9** below.

Table 13.9: Windfarms Considered in Cumulative Assessment

Windfarm	Status	No of turbines	Distance from Closest Development Turbine (km)
Altaveedan	Operational	9	3.9 km
Ballybogie Hill	Operational	1	5.9 km
Ballymena	Operational	2	17.1 km
Cloonty	Operational	4	18.7 km
Connaught Road	Operational	2	29.0 km
Coolkeeran Road (100)	Operational	1	5.2 km
Coolkeeran Road (134)	Operational	2	4.9 km
Corby Knowe	Operational	3	28.5 km
Corkey Road (145/1)	Operational	1	2.8 km
Corkey Road (163)	Operational	1	2.3 km
Corkey Road (99)	Operational	1	2.6 km
Elginny Hill	Operational	10	11.2 km
Elliots Hill	Operational	10	27.0 km
Garves	Operational	5	11.4 km
Glenbuck	Operational	1	11.3 km
Glenbuck II	Operational	3	11.3 km
Gruig	Operational	10	0.7 km
Gruig Lane (15)	Operational	1	2.1 km
Long Mountain	Operational	12	10.8 km
Loughgiel Community Ass,	Operational	1	4.2 km
Moneyduff Road (15)	Operational	1	5.1 km
Moneyduff Road (46)	Operational	1	4.3 km
Omerbane Road (24)	Operational	1	3.5 km
Omerbane Road (31)	Operational	1	3.5 km
Omerbane Road (29)	Operational	1	4.2 km
Reservoir Road (21)	Operational	1	0.4 km

Reservoir Road (15)	Operational	1	0.8 km
Rathsherry	Operational	9	10.4 km
Sheltin Road	Operational	1	3.5 km
Wolf Bog	Operational	5	27.1 km
Ballykeel	Consented	7	29.1 km
Ballyveely Road (96)	Consented	1	4.5 km
Cam Burn	Consented	6	27.4 km
Castlegore	Consented	4	26.3 km
Corkey Road (18)	Consented	1	2.9 km
Corkey Road (8)	Consented	1	3.3 km
Corkey Road (108)	Consented	1	2.0 km
Corkey Road (237)	Consented	1	2.7 km
Corkey Extn.	Consented	1	1.0 km
Corkey Road (145/2)	Consented	1	2.8 km
Craig 1	Consented	1	15.0 km
Craig 2	Consented	1	14.9 km
Drone Road (250)	Consented	1	5.1 km
Drumbare Road	Consented	1	6.2 km
Gruig Lane (12)	Consented	1	2.4 km
Loughill Road (48)	Consented	1	4.9 km
Moneyduff Road (35)	Consented	1	4.8 km
Tullykittagh Road 1 (58)	Consented	1	3.5 km
Tullykittagh Road 2 (48)	Consented	1	3.3 km
Whappstown	Consented	4	26.2 km
Carnalbanagh	Application	7	19.1 km
Armoy	Application	6	8.7 km
Ballyveely Road (99)	Application	1	3.2 km

148. Windfarms that are operational or under construction are considered as ‘baseline’ windfarms. There is less certainty that consented and application stage windfarms will be constructed. 23 of the windfarms within 30km of the Development are consented or application stage windfarms and as such, the economic benefits arising from these schemes are yet to be realised.

13.8.4 Direct Employment Opportunities

149. Should all of the schemes identified above be constructed and operated it is considered that the cumulative effect on direct employment will be positive for the Local and Regional Study Areas. The contribution of the Development to this positive effect is assessed as being of positive minor magnitude. This is on the basis that the 5 turbines of the Development equate to approximately 8.9% of the 56 turbines (including the Development turbines) either consented or the subject of a planning application.

13.8.5 Indirect Economic Benefits

150. If all the schemes identified within 30km of the windfarm are constructed and operated it is considered that there will be a positive cumulative effect on indirect economic benefits for the people of Local and Regional Study Areas. The contribution of the Development to this positive effect will be minor.

13.9 Summary of Effects

151. Table 13.10 summarises the effects assessed in this chapter.

152. **Table 13.10: Summary of Effects**. All effects are adverse, unless otherwise stated.

Receptor	Potential Effect	Significance of Effect	Mitigation/ enhancement Proposed	Residual Effect	Cumulative Effect
Decommissioning / Construction Phase					
Tourism and Recreation					
Moyle Way	Indirect and temporary, from visual changes and construction noise	Negligible	None	Negligible (temporary)	Negligible (temporary)
Lissanoure Castle and Gardens	Indirect and temporary, on visitor traffic and views	Negligible	None	Negligible (temporary)	Negligible (temporary)
Altnahinch Reservoir	Indirect and temporary, resulting from visual changes and construction noise which will adhere and meet with recognised noise limits, and agreed construction hours of working.	Negligible	None	Negligible (temporary)	Negligible (temporary)
Land Use					
Land Use	Direct, temporarily increased footprint and cessation of current uses such as agricultural practices within the decommissioning/construction site	Minor	None	Minor (temporary)	Negligible
Socio-Economic					
Economic	Direct, job creation (beneficial) Indirect, expenditure (beneficial)	Minor	SPR will seek to secure positive benefits for the local/regional economy by encouraging the use of local labour, manufacturers and suppliers were possible. ‘Meet the Developer days’	Minor (temporary positive)	Minor (beneficial)
Operation					
Tourism and Recreation					
Moyle Way	Indirect, from visual changes and turbine noise	Negligible	None	Negligible (permanent/reversible)	Negligible (permanent)
Lissanoure Castle	Indirect, due to views of the Development	Negligible	None	Negligible (permanent/reversible)	Negligible (permanent)
Altnahinch Reservoir	Indirect, due to visual changes and turbine noise	Negligible	None	Negligible (permanent/reversible)	Negligible (permanent)
Land Use					
Land Use	Direct, beneficial, altered footprint results in an increase in site value as a result of a larger capacity	Minor	None	Minor (beneficial/ permanent/ reversible)	Negligible

Receptor	Potential Effect	Significance of Effect	Mitigation/ enhancement Proposed	Residual Effect	Cumulative Effect
	windfarm, adding to the diversification and sustainable use of the Site				
Socio-Economic					
Economic	Direct, job creation (beneficial) Indirect, expenditure (beneficial)	Minor	None	Minor (beneficial/ permanent/reversible)	Minor (beneficial)

13.10 Statement of Significance

153. No significant residual effects are predicted on tourism and recreation as a result of the initial decommissioning/construction or operational phases of the Development. No significant cumulative effects are predicted on tourism and recreational receptors.

154. No significant residual effects are predicted on land use as a result of initial decommissioning/construction or operational phases of the Development. No significant cumulative effects are predicted on the land use.

155. Positive and beneficial effects on local employment and the local (Causeway Coast and Glens Study Area) and regional (Northern Ireland) economy are predicted during the initial decommissioning/construction and operational phases of the Development. These effects will not be significant. Minor beneficial cumulative effects are predicted on local employment and the local and regional economy.

13.11 Glossary

Table 6.8 Glossary of Terminology

Term	Definition
The Site	Refers to all land that falls within the red line boundary.
The Site Boundary	Refers to the red line boundary as defined at the time of Scoping.
Operational Corkey Windfarm	Refers to the existing Corkey Windfarm at the Site, which has been operational since 1994.
The Development	Refers to all elements of the application for the repowering of the Operational Corkey Windfarm the details of which are set out within **Chapter 3: Development Description**. These elements include the wind turbines, all site infrastructure, access tracks, energy storage etc.
Study Areas	Refers to areas which are considered as part of the assessment process. These are specific and defined within each technical section and should reflect those described in the Scoping Report. Study Area distances should specify whether these are measured from the site centre, turbine positions or Site Boundary, for consistency the Site Boundary is preferred.
The Council	Refers to the Causeway Coast and Glens Borough Council.
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
D0E	Department of the Environment
ES	Environmental Statement
km	Kilometre
LDP	Local Development Plan
NCR	National Cycle Route
NITB	Northern Irish Tourism Board
RDS	Regional Development Strategy
SEF	Strategic Energy Framework
SPPS	Strategic Planning Policy Statement

14 Other Issues

14.1 Introduction

1. This chapter of the Environmental Statement (ES) evaluates the effects of the Development on issues not covered elsewhere in the ES, which include:

- Telecommunications and Utilities;
- Shadow Flicker;
- Aviation and Radar;
- Human Health;
- Climate Change (including a carbon balance assessment); and
- In-combination effects associated with the interrelationships between ES chapters.

2. This assessment was undertaken by Arcus Consultancy Services Limited (Arcus) with aviation provided by ScottishPower Renewables (the Applicant). The assessment will consider the potential significant effects of the Development during the following phases of the Development:

- Decommissioning of the Operational Corkey Windfarm (initial phase of the Development);
- Construction of the Development (likely to occur in tandem with the above phase);
- Operation of the Development; and
- Decommissioning of the Development (final phase).

3. The decommissioning of the Operational Corkey Windfarm and the construction of the Development is likely to occur partly in tandem and would have a greater effect than if the two processes were to arise at different times. This represents a worst-case scenario for assessment purposes. Any effects arising as a result of the future decommissioning of the Development are considered to be no greater than the effects arising when these first two phases are combined. As a result, the final decommissioning phase has not been considered further in this assessment.

4. This Chapter of the ES is supported by the following Technical Appendix documents provided in **Volume 3 Technical Appendices**:

- Technical Appendix A14.1: Carbon calculator inputs and results
- Technical Appendix A14.2 Health and Safety Statement

5. This Chapter includes the following elements:

- Introduction;
- Individual assessments of each of the topics listed above; and
- Statement of Significance.

6. Common acronyms used throughout this ES can be found in **Chapter 1: Introduction, Table 1.4.**

14.2 Telecommunications and Utilities

14.2.1 Scope

7. Due to the size and nature of wind turbines, they have the potential to interfere with electromagnetic signals passing above ground during operation, or existing infrastructure buried below ground during any decommissioning/construction activity. Infrastructure affected can include telecommunication links, microwave links, television reception and overhead and underground utility cables.

8. The switchover from analogue to digital television signals was completed in Northern Ireland in October 2012. The potential for negative effects on domestic television reception are greatly diminished post digital switchover. The existing and proposed Development turbines do not lie in a direct line of sight between a television transmitter and receptor locations, and hence the only potential for effects would be reflection of transmitted signals. As noted by EMC Consultants Ltd[1]: "*Unlike analogue television, digital television does not tend to suffer as badly from reflections (multi-path transmissions) causing delayed images and, has much greater immunity to this type of interference. Even the weakest received primary signals (up to a certain point) are recognised and can then be fully reconstituted, but secondary delayed signals are rejected. In fact, received reflected signals can actually increase received signal strength/quality.*" Since digital switchover there have been very few known cases of wind turbine interference with domestic analogue reception. Therefore, potential effects on television signal from the Development will be negligible and are not considered further. Additionally, it should be noted, that the Development will involve the replacement of the 10 turbines that form the Operational Corkey Windfarm, which have been operating successfully for the last 25 years, with five turbines.

9. Microwave links can be affected by reflection, diffraction, blocking and radio frequency interference caused by wind turbines in their line of sight. In general, the directional nature of telecommunications and microwave links means that interference can be avoided by defining clearance zones beyond which any degradation of the links will be insignificant.

14.2.2 Assessment Methodology

10. The potential effects assessed in this Chapter have been identified through consultation and desk based technical assessments. Effects during the initial decommissioning/construction phases are classed as temporary, short term effects. Potential effects which are associated with the operational phase of the Development are classified as permanent, but reversible should the Development be decommissioned.

11. It is industry practice not to assess the effects on telecommunications and utilities links from windfarms during the decommissioning and construction phases, because effects are similar to, but less than, those encountered during the operational phase which is significantly longer in duration. Consequently, this assessment does not further consider effects associated with decommissioning/construction activities on these receptors, rather operational effects should be considered to form a robust worst case assessment which also covers these activities.

12. Effects on these receptors are of a technical nature, and where unacceptable effects are predicted to occur, a technical solution may be sought with the owner/operator of the infrastructure to ensure the continued acceptable operation of the infrastructure. Following this approach, it is inappropriate to assess the significance of these effects in relation to the Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 in the same way as for other receptors presented in this ES.

14.2.3 Guidance

13. There are a number of documents which provide guidance on telecommunications and utilities considerations for wind energy developments. The guidance documents considered in this assessment are:

- Department for the Environment (2009), Planning Policy Statement 18 (PPS18): Renewable Energy[2];
- British Wind Energy Association (BWEA), (1994) Best Practice Guidelines for Wind Energy[3];
- Ofcom (2003) Guidelines for Improving Digital Television and Radio Reception[4];
- Ofcom (2009) Tall Structures and Their Impact on Broadcast and Other Wireless Services[5]; and
- Department of the Environment (DoE) (2009) Planning Policy Statement 18: Renewable Energy[6].

[1] Austin, S. (EMC Consultants Ltd) (2018). Canada Water Masterplan: Radio and Television Interference Assessment. Available at: http://planbuild.southwark.gov.uk/documents/?GetDocument=%7B%7B%7B!mkjYAPlA%2FgZgn6QRYqB2Zg%3D%3D!%7D%7D%7D [accessed on 16/4/2019].
[2] Department of the Environment (2009). Planning Policy Statement 18: Renewable Energy. Available online at: https://www.planningni.gov.uk/index/policy/planning_statements/planning_policy_statement_18_renewable_energy-2.htm [Accessed on 27/09/2017]
[3] British Wind Energy Association, (1994), Best Practice Guidelines for Wind Energy Development British Wind Energy Association, United Kingdom. Available online at: http://www.energy.ca.gov/windguidelines/documents/other_guidelines/BWEA-BPG.PDF [Accessed 14/09/2017]
[4] OFCOM, (2003), Guidelines for Improving Digital Television and Radio Reception, OFCOM, United Kingdom.
[5] OFCOM, (2009), Tall Structures and Their Impact on Broadcast and Other Wireless Services, OFCOM, United Kingdom. Available online at: http://licensing.ofcom.org.uk/binaries/spectrum/fixed-terrestrial-links/wind-farms/tall_structures.pdf [Accessed 14/09/2017]
[6] Department of the Environment (DoE) (2009). Planning Policy Statement 18: Renewable Energy. Available online at: https://www.planningni.gov.uk/index/policy/planning_statements/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf [Accessed 14/09/2017]

14. The potential effects generated by the Development have been assessed with reference to the above documents.

15. Best Practice Guidance to Planning Policy Statement 18: Renewable Energy[Error! Bookmark not defined.] makes reference to the potential of wind turbines to affect electromagnetic signals. Paragraph 1.3.59 states that "*provided careful attention is paid to siting, wind turbines should not cause any significant adverse effects on communication systems which use electromagnetic waves as the transmission medium".*

16. This document also provides guidance on how turbine siting can mitigate potential effects. Paragraph 1.3.61 states that "*specialist organisations for the operation of the electromagnetic links typically require a 100 m clearance either side of a link from the swept area of turbine blades, although some operators are willing to accept Fresnel zones of avoidance".* Fresnel zones surround telecommunication links, which, if impinged, upon can degrade the quality of the telecommunication link; the size of the Fresnel zone is dependent on the frequency and length of the link.

14.2.4 Consultation

17. Consultation with the relevant organisations was initiated during the initial stages of the EIA to identify any potential microwave or telecommunication links that could be affected by the Development. An area of search was specified as a 2 km radius of the approximate centre point of the turbine envelope. Ofcom monitors the fixed microwave links throughout the UK, whereas JRC manages the radio spectrum used by the UK Fuel and Power Industry. Atkins undertakes a similar role for the water industry (although does not manage links operated by Northern Ireland Water Ltd (NI Water)). The findings are summarised in **Table 14.1.**

Table 14.1: Summary of Consultation Responses on Telecoms

Consultee	Type and Date	Summary of Consultation Response
Ofcom Spectrum Licencing	Email dated 21/03/17	Identified two links which have the potential to be affected, operated by Police Service of Northern Ireland (PSNI) and NI Water. See comments below.
PSNI	Email dated 17/08/17	PSNI stated that the Development is unlikely to affect the operation of their links within the vicinity.
NI Water	Email 30/01/19	NI Water stated that they have no objection to the proposed turbine locations.
Joint Radio Company (JRC)	Email dated 30/3/17	Five links were identified, JRC requested an exclusion zone of 500 m around most base sites, 500 m – 1 km separation required of all links.

14.2.5 Assessment of Effects

14.2.5.1 Telecommunications and Television Reception

18. Details of the Development have been shared with the known link operators.

19. Ofcom produced a fixed link report which identified two potential links within the search area, licensed to PSNI and NI Water. PSNI and NI Water were contacted and confirmed that they had no objection to the Development based on potential interference to telecommunications links.

20. JRC identified five links within the search area. Three of the links originate from within the Site; one associated with the Operational Corkey Windfarm, which will no longer be used following the decommissioning of the current substation, and two links associated with a privately owned single turbine located to the north of the Site which pass to the north of the turbine positions and do not cross the Site. A further two links are associated with the operational Gruig Windfarm to the south-west and the links do not cross the Site. These links will therefore not be affected by the Development.

21. Atkins Global identified no links in the search area and do not object to the Development.

22. Broadcast radio (FM, AM and DAB digital radio) are transmitted on lower frequencies than those used by analogue TV signals. Lower frequency signals tend to pass through obstructions more easily than the higher frequency TV signals, and diffraction effects also become less significant at lower frequencies. Both of these factors will tend to lessen the effect of wind turbines on radio reception. In the event that interference which is directly attributable to the Development is experienced, the Applicant will endeavour to implement a suitable mitigation solution. Examples of technical solutions include: changing the receptor height, re-orientating the receptor to receive signals from an alternative transmitter, upgrading the receptor system or installation of satellite television.

23. Based on the information received during consultation and the remote nature of the Development from properties, no effects are predicted on telecommunications or radio reception as a result of the Development.

14.2.5.2 Utilities

24. Development traffic will use public roads for site access and existing site tracks for accessing the area in which the Operational Corkey Windfarm turbines are sited, and in which the proposed turbines would be sited. An overhead cable runs parallel with Reservoir Road and overhead electricity wires cross Reservoir Road in a perpendicular manner at the entrance to 15 Reservoir Road. Should the overhead infrastructure require alteration, and planned outages are necessary in order to re-locate the cables either by temporarily raising them or permanently burying them underground to facilitate the turbine delivery and ongoing maintenance, best practice measures will be followed. These measures include minimising the length of time any outages occur with residents notified of the planned works in order to minimise any disruption to those residents potentially affected.

25. The earthworks for the initial decommissioning/construction activity are proposed on the site of the Operational Corkey Windfarm, and there are no buried utilities, other than those used by the Operational Corkey Windfarm infrastructure.

26. As a result, the potential for damage to any utilities infrastructure during the decommissioning/construction phases is low, and services checks will be carried out pre-construction to minimise potential effects and ensure relevant health and safety legislation is complied with.

27. Thereafter during operation, there will be no disturbance to existing utilities.

14.2.1 Summary of Effects

28. Any effects arising from alterations to the existing overhead infrastructure in the vicinity of the site entrance will be short term and temporary. These effects would only occur during the initial decommissioning / construction phases for a short duration whilst the necessary works are carried out. There are **no significant** effects predicted on telecommunications, television/radio reception or utilities as a result of the Development.

14.3 Shadow Flicker

14.3.1 Scope

29. Shadow flicker is an effect that can occur when the sun moves behind a wind turbine rotor and the shadows of moving wind turbine blades passing over a small narrow opening (window) within a property, briefly reducing the intensity of light within the room and causing a flickering to be perceived. The likelihood and duration of shadow flicker depends upon the positioning of the sun, turbine and window locations, turbine orientation, time of day, time of the year and weather conditions.

30. Flickering light can have the potential to cause disturbance and annoyance to residents if it affects occupied rooms of a house. Individuals with photosensitive epilepsy can be sensitive to flickering light that is usually in the range of 3-50 Hertz (Hz). The frequencies of flicker caused by modern turbines (less than 1 Hz) are below the frequencies known to trigger effects in these individuals[7] and therefore shadow flicker from turbines is not predicted to affect any individuals with photosensitive epilepsy. These effects are therefore scoped out and not considered further in this assessment. Potential effects are considered in the context of nuisance.

14.3.2 Assessment Methodology

31. The potential effects assessed in this Chapter have been identified through technical assessments in line with the Best Practice Guidance detailed in **Section 14.3.3**.

[7] Epilepsy Action, (2007), Photosensitive Epilepsy. Available online at: http://www.epilepsy.org.uk/info/photosensitive-epilepsy [Accessed 07/06/2019].

32. ReSoft's Windfarm software was used to represent the turbine locations and dimensions, and those of residential receptors, and to model the potential shadow flicker effects at the receptor locations for each hour of a year, assuming no cloud cover or intervening vegetation, creating worst -case parameters.

14.3.3 Guidance

33. Guidance presented within the Best Practice Guidance to PPS18: Renewable Energy describes shadow flicker as an effect that: *"Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as 'shadow flicker'. It only occurs inside buildings where the flicker appears through a narrow window opening. A single window in a single building is likely to be affected for a few minutes at certain times of the day during short periods of the year. The likelihood of this occurring and the duration of such an effect depends upon:*

- *the direction of the residence relative to the turbine(s);*
- *the distance from the turbine(s);*
- *the turbine hub-height and rotor diameter;*
- *the time of year;*
- *the proportion of day-light hours in which the turbines operate;*
- *the frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and,*
- *the prevailing wind direction.*

34. *Problems caused by shadow flicker are rare. At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times.*

35. *Careful site selection, design and planning, and good use of relevant software, can help avoid the possibility of shadow flicker in the first instance. It is recommended that shadow flicker at neighbouring offices and dwellings within 500 m should not exceed 30 hours per year or 30 minutes per day".*

36. Planning Practice Guidance for Renewable and Low Carbon Energy[8] was published by the UK Government Department for Communities and Local Government in 2013. Although this guidance only applies in England, it provides additional technical information on onshore wind power which is still applicable. The Planning Practice Guidance describes the conditions in the UK under which flicker might occur and states that *"only properties within 130 degrees either side of north, relative to the turbines can be affected at these latitudes in the UK – turbines do not cast long shadows on their southern side"*.

37. A detailed study was undertaken by Parsons Brinckerhoff Consultants on behalf of the Department of Energy and Climate Change (DECC) in 2010 to update the government's evidence of shadow flicker[9]. This research drew the following conclusions:

- *"The study area of 130 degrees north detailed in the current government guidance was considered appropriate;*
- *It confirmed that there is unlikely to be a significant effect at distances greater than 10 rotor diameters; and*
- *The frequency of flicker from modern wind turbines is unlikely to cause any health effects and nuisance and is not considered as a significant risk."*

14.3.3.1 Study Area

38. In line with the PPS18 on onshore wind, a 'Study Area' of ten rotor diameter distance (1,200 m) and 130 degrees either side of north around each proposed turbine location was mapped using a Geographical Information System (GIS). The same criteria was applied to the Cumulative Study Area for the turbine located at 15 Reservoir Road (270 m) as shown on **Figures 14.1** and **14.2** respectively.

14.3.4 Consultation

Consultation with the relevant organisations was initiated during the initial stage of the EIA to identify potential shadow flicker effects that could be linked to the Development. A summary of the findings are detailed in **Table 14.2**.

Table 14.2: Summary of Consultation Responses on Shadow Flicker

Consultee	Type and Date	Summary of Consultation Response
Causeway Coast and Glens Borough Council	Letter 28/02/2018	The Council is content that should no properties fall within 10 rotor diameters and 130 degrees North of the Development then shadow flicker can be screened out but a note of this should be included within the ES to show that it has been considered as it is a requirement of PPS18.

14.3.5 Baseline Conditions

39. The Operational Corkey Windfarm has no properties within ten rotor diameters, and there is no assessed shadow flicker effect in the baseline scenario.

40. Three properties (potential receptors, used as assessment locations) have been identified within 1,200 m of turbine locations in the Development and 130 degrees of North which forms the Study Area for this assessment.

Table 14.3 details the three properties within the shadow flicker Study Area. These are also shown in **Figure 14.1,** the Cumulative Study Area is shown on **Figure 14.2**.

Table 14.3: Potential Shadow Flicker Assessment Locations

Property Name	Easting	Northing	Nearest Turbine	Distance to Nearest Turbine (m)
21 Reservoir Road	309979	422676	3	770
42 Reservoir Road	309761	422704	3	988
15 Reservoir Road	309652	422220	4	1,052

14.3.6 Assessment of Effects

14.3.6.1 Decommissioning/Construction Phase

41. Shadow flicker is a phenomenon that only occurs once the turbines are installed and operational and thus no shadow flicker effects are anticipated during the initial decommissioning/construction phases of the Development, until turbine construction has been completed and the turbines are commissioned and turning. Effects following the start of commissioning are considered as the operational phase.

14.3.6.2 Operational Phase

42. **Table 14.4** details the results of the calculations carried out for the three assessment locations identified using the shadow flicker modelling software. The table shows the calculation of the predicted potential number of hours of shadow flicker per annum (assuming no cloud cover).

43. It has been calculated that theoretical shadow flicker may occur at the three properties individually assessed.

44. A conservative approach has been taken, initially, whereby the screening effects provided by topography, trees or other buildings have not been taken into account, nor has any account been taken of which building facades have confirmed window openings (it has been assumed in the assessment that all facades have windows). This will reduce or eliminate flicker from occurring in practice. The degree of effects will depend on the precise position and width of windows facing the proposed turbines and the precise location of screening, which itself may change over time as vegetation grows or is

[8] Department for Communities and Local Government, (2013), Planning Practice Guidance for Renewable and Low Carbon Energy. Available online at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/225689/Planning_Practice_Guidance_for_Renewable_and_Low_Carbon_Energy.pdf. [Accessed 07/06/2019].

9 Department of Energy and Climate Change (DECC), (undated), Update of UK Shadow Flicker Evidence Base. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48052/1416-update-uk-shadow-flicker-evidence-base.pdf [Accessed 07/06/2019].

removed. In addition, the atmospheric conditions, principally cloud cover, will further reduce the actual effects arising. As a result, accurate predictions of shadow flicker on an hourly basis are not possible, and this assessment considers a worst-case approach.

45. For much of a given year, weather conditions will be such that shadows would not be cast, or would be weak and thus would not give rise to shadow flicker effects. Based upon weather conditions required to facilitate shadow flicker occurring for less than 13% of the time[10], the likely number of hours per year where shadow flicker could potentially occur is shown in **Table 14.4** below.

Table 14.4: Potential Shadow Flicker Effects at the Assessed Locations

Name	Window Orientation	Days Per Year	Maximum Minutes per day	Theoretical Maximum Hours per Annum	Likely Hours per Annum
21 Reservoir Road	North	0	0	0	0
	East	95	37	42	6
	South	95	37	42	6
	West	0	0	0	0
42 Reservoir Road	North	0	0	0	0
	East	77	30	28	3.5
	South	77	29	28	3.5
	West	0	0	0	0
15 Reservoir Road	North	52	28	19	2.5
	East	89	29	33	4
	South	37	28	13	1.5
	West	0	0	0	0

46. The theoretical maximum number of hours per annum, as shown in **Table 14.4**, is for all windows and accounts for any overlap where effects may be experienced at different windows or from different turbines simultaneously. As such, shadow flicker effects are calculated as being possible for up to a theoretical maximum of 42 hours at 21 Reservoir Road, 28 hours for 42 Reservoir Road and 33 hours at the property at 15 Reservoir Road.

47. Accounting for typical weather conditions across a year, the actual likely shadow flicker effect is much lower and is estimated as 6 hours per annum at 21 Reservoir Road, 3.5 hours at 42 Reservoir Road and 4 hours per annum for 15 Reservoir Road.

48. Further investigation of all three properties has been undertaken based on aerial imagery and photographs available from site visits. All 3 properties appear to have large windows which will reduce the likely shadow flicker effect. The property located at 15 Reservoir Road is orientated northwest/southeast with very large windows on all sides of the extension, which is on the north eastern side of the house. Smaller windows are located on the main house building, these face southeast rather than towards the Site. 21 Reservoir Road is orientated southwest/northeast looking along the valley with a steep scarp slope on the south eastern side. There are no apparent windows on the gable ends. The property located at 42 Reservoir is orientated southwest/northeast and is surrounded by farm buildings and hedges. . As a result, effects are likely to be much lower, with the potential for no shadow effects, than the worst-case scenario assessed here.

49. Other than the properties identified in **Table 14.3**, the next nearest properties are generally located to the west of the Development, at a distance of around 1,330 m. Given the distance from the turbines, shadow flicker effects outside the 10 rotor diameter study area are unlikely, based on PPS18[11].

50. As **Table 14.4** shows, based on the theoretical shadow flicker effects, no location within the Study Area exceeds the 30 hours per year identified within the Northern Ireland guidance. As a worst-case scenario, at one of the properties considered, it is theoretically possible that, on a clear day, shadow flicker could occur for up to 37 minutes in a given day at 21 Reservoir Road. Analysis undertaken in the Resoft's Windfarm software, found that the exceedance of the 30 minutes per day threshold set out in guidance could theoretically occur on only 40 days per year. Whilst this is the worst-case scenario, aerial imagery available for 21 Reservoir Road shows that the property is orientated perpendicular to the Development and has large windows. As a result, effects are likely to be much lower, with the potential for no shadow flicker effects, than the worst-case scenario assessed here. In any event mitigation is proposed, should this be required, in **Section 14.3.7** to ensure any nuisance from shadow flicker is avoided.

14.3.6.3 Cumulative Effects

51. Developments with the potential to give rise to cumulative effects, in general, are detailed in **Technical Appendix A2.3 List of Cumulative Sites**. The nearest windfarm, either existing or proposed, is Gruig, a ten turbine, 80 m rotor diameter development located c. 1 km south-east of the Development. The distances to the aforementioned properties from the nearest Gruig turbine are:

- 21 Reservoir Road is located approximately 2,360 m to the north of the nearest Gruig turbine;
- 42 Reservoir Road is located approximately 2,560 m to the north of the nearest Gruig turbine; and
- 15 Reservoir Road is located approximately 2,000 m to the north of the nearest Gruig turbine.

52. As these distances exceed the 10-rotor diameter distance for likely shadow flicker effects (800 m), shadow flicker effects from Gruig at these properties are unlikely to occur. Cumulative shadow flicker effects from Gruig have therefore not been considered further.

53. There are three proposed or operational single turbines located near the Site. These are Reservoir Road (15), Reservoir Road (21), and Corkey Extension. These are shown on **Figure 6.12**. Corkey Road (188) single turbine permission has expired, and no turbine has been built as confirmed by the landowner; as a result, this turbine has not been assessed.

54. The operational Reservoir Road (15) (Application number D-2011-0043-F), a single turbine, with an assumed rotor diameter of 27 m (Vestas V27), is located 1.1 km south-west of the Development. The nearest property to this turbine is the property at 15 Reservoir Road located approximately 200 m east. As this distance does not exceed the 10-rotor diameter distance for likely shadow flicker effects (270 m), a cumulative shadow flicker assessment has been undertaken to assess the cumulative effects on the property at 15 Reservoir Road with the Development. This is shown in **Figure 14.2**.

55. The operational Reservoir Road (21) (Application Number D/2013/0081/F), a single turbine, with an assumed rotor diameter of 25 m and hub height of 45 m (based on a consented maximum of 67 m to blade tip), is located 750 m north of the Development. The nearest property to this turbine is 21 Reservoir Road located approximately 713 m southwest. As this distance exceeds the 10-rotor diameter distance for likely shadow flicker effects (250 m), shadow flicker impacts from Reservoir Road 2 at this property are unlikely to occur. Cumulative shadow flicker effect from the single turbine at Reservoir Road 2 has therefore not been considered further.

56. The consented Corkey Extension (Application Number D/2010/0060/F), a single turbine, with an assumed rotor diameter of 72 m and hub height 64 m (based on a consented height to blade tip of 100 m), is located 1.8 km north-west of the nearest Development turbine. The nearest property to this turbine is 42 Reservoir Road located approximately 812 m south. As this distance exceeds the 10-rotor diameter distance for likely shadow flicker effects (720 m), it is considered that shadow flicker

[10] Met Office (2019). Northern Ireland: Climate: Sunshine. Available at: https://www.metoffice.gov.uk/climate/uk/regional-climates/ni#sunshine [accessed on 21/02/2019]. Quotes: "*The dullest parts of Northern Ireland are the upland areas of the north and west, with annual average totals of less than 1100 hours.*"

[11] Department of the Environment (2009) Planning Policy Statement 18. Available online at https://www.planningni.gov.uk/index/policy/planning_statements_and_supplementary_planning_guidance/planning_policy_statement_18__renewable_energy.pdf [Accessed 09/05/2019].

effects from Corkey Extension at this property are unlikely to occur in practice. Cumulative shadow flicker effects from the single turbine at Corkey Extension have therefore not been considered further.

14.3.6.3.1 Initial Decommissioning / Construction Phases

57. Shadow flicker is a phenomenon that only occurs once the turbines are installed and operational (blades turning) and thus no cumulative shadow flicker effects are anticipated during the initial decommissioning/construction phases of the Development.

14.3.6.3.2 Operational Phase

58. **Table 14.5** details the results of the calculations carried out for the one cumulative assessment location identified (15 Reservoir Road) using the shadow flicker modelling software for the Development and the single turbine at Reservoir Road (15) combined. Results are only presented for 15 Reservoir Road as this is the only property shown to have the potential to receive cumulative shadow flicker effects from the Development and the single turbine identified as Reservoir Road (15) and. The table shows the calculation of the predicted likely number of hours of shadow flicker per annum.

Table 14.5: Potential Shadow Flicker Cumulative Effects at the Assessed Location

Name	Window Orientation	Days Per Year	Maximum Minutes per day	Theoretical Maximum Hours per Annum	Likely Hours per Annum
15 Reservoir Road	North	52	28	19	2.5
	East	103	40	45	6
	South	51	40	26	3
	West	0	0	0	0

59. With regard to financially involved properties, it is understood that the resident of 15 Reservoir Road has a financial interest in the turbine located on its own land, Reservoir Road (15) (Application number D-2011-0043-F), which is the turbine giving the potential for cumulative shadow flicker effects.

60. The theoretical maximum number of hours per annum, as shown in **Table 14.5**, is for all windows and accounts for any overlap where effects may be experienced at different windows or from different turbines simultaneously. As such, cumulative shadow flicker effects are calculated as being possible for up to a theoretical maximum of 45 hours at 15 Reservoir Road.

61. For much of a given year, weather conditions will be such that shadows would not be cast, or would be weak and thus would not give rise to shadow flicker effects. Based upon weather conditions required to facilitate shadow flicker occurring for only 13% of the time, the likely number of hours per year where cumulative shadow flicker could potentially occur is reduced to 6 hours per annum at 15 Reservoir Road.

62. The cumulative effect at 15 Reservoir Road, arising from the combination of the Reservoir Road 1 turbine, in which the property has a financial interest, together with the Development has increased the likely shadow flicker effects by 4 hours per annum.

63. As **Table 14.5** shows, the property at 15 Reservoir Road does not experience shadow flicker for more than the 30 hours per year identified within the Northern Ireland guidance. It is theoretically possible that, on a clear day, shadow flicker could occur for up to 40 minutes per day at 15 Reservoir Road. Analysis undertaken in the Resoft's Windfarm software, found that the exceedance of the 30 minutes per day threshold set out in guidance effect could theoretically occur on only 33 days per year. Information available from aerial imagery and photographs taken from site visits, shows that the property at 15 Reservoir Road has very large windows on all sides of the extension, which is on the north eastern side of the house. Smaller windows are located on the main house building, these appear to face south-east rather than towards the Site. As a result, cumulative shadow flicker effects are likely to be much lower, and may not be experienced at all. In any event mitigation can be deployed, if required, as set out in **Section 14.3.7** to ensure nuisance from shadow flicker is avoided.

14.3.7 Mitigation Measures and Residual Effects

64. It has been demonstrated that shadow flicker effects have the potential to occur at three receptors within the shadow flicker study area based on worst case theoretical model parameters, i.e. those on Reservoir Road. A conservative approach has been taken, whereby the screening effects provided by topography, trees or other buildings have not been taken in account, and it has been assumed that there are narrow windows on all sides of each receptor. Screening, or the absence of windows, may reduce or eliminate flicker from occurring in practice.

65. Several forms of mitigation for shadow flicker are available, including:

- Control at Receptor: The provision of blinds, shutters or curtains to affected properties;
- Control on Pathway: for example screening planting close to an affected property; and
- Control at Source: for example shutdown of turbines at times when effects occur.

66. In practice, control at receptor and on pathway is only possible with the cooperation of the residents, which cannot be assumed to be forthcoming. In addition, planting screening may take some time before it is effective.

67. Control at source will prevent shadow flicker from occurring. This involves shutting the turbine down at times that flicker is likely to occur. These times can be pre-calculated and programmed into the wind farms SCADA system (shutdown calendar). Photocells can also be installed that determine whether ambient light levels are sufficient for distinct shadows (and therefore shadow flicker) to be generated to prevent unnecessary shutdowns.

68. Alternatively, a shadow flicker protection system can be incorporated into the SCADA system. This calculates the locations of shadows in real time, determines whether these coincide with pre-programmed locations and takes into account ambient lighting before triggering a shutdown. These systems provide greater flexibility than shutdown calendars as it allows for new locations to be programmed.

69. Application of the above measures, in the event that mitigation is actually required, will ensure that effects are minimised or avoided entirely in the event that they arise. Following implementation of the proposed mitigation measures, all shadow flicker effects are assessed as not significant.

70. A suitably worded planning condition could be included to mitigate against any potential effects associated with shadow flicker.

14.3.8 Summary of Effects

71. No shadow flicker effects will occur during the initial decommissioning/construction phases.

72. The effect of shadow flicker has been assessed using appropriate guidance, on the three residential properties within 10 rotor diameters of the proposed turbine locations. Potential effects based on worst case model parameters, show a marginal exceedance of the guidance thresholds at 1 property, with all effects at two other properties being below the thresholds.

73. Cumulative shadow flicker effects has been identified at 1 property, 15 Reservoir Road. Information available from aerial imagery and photographs taken from site visits, shows that this has very large windows on all sides of the extension, which is on the north eastern side of the house. Smaller windows are located on the main house building, but these face southeast rather than towards the Site. As a result, cumulative shadow flicker effects are likely to be much lower, and may not be experienced at all.

74. In the event that a shadow flicker event occurs, mitigation can be deployed in the form of a series of measures following commencement of operation of the Development. These mitigation measures would reduce the effects or remove flicker affects entirely.

75. Any residual effects from shadow flicker would therefore be not significant in terms of the EIA Regulations.

14.4 Aviation and Radar

14.4.1 Scope

76. The operation of wind turbines has the potential to cause a variety of adverse effects on aviation during turbine operation. These include but are not limited to:

- Physical obstructions;
- Generation of unwanted returns on Primary Surveillance Radar (PSR); and
- Adverse effects on overall performance of Communications, Navigation and Surveillance (CNS) equipment.

77. The Site is approximately 40 km north of Belfast International Airport (BFS), over 50 km northwest of Belfast City Airport and over 50 km east of City of Derry Airport, the three major airports in Northern Ireland. The turbines of the Operational Corkey Windfarm are within radar line of sight of BFS's PSR, and have been accommodated to date by both the airport and NATS (En Route) Plc (NATS) which also uses the BFS radar. The Operational Corkey Windfarm is not in radar line of sight of Belfast City Airport's radar while the City of Derry Airport does not currently have radar facilities.

78. There are no active Royal Air Force (RAF) bases within 50 km of the Site and there are no operational airfields within a 20 km radius of the Development. The Development is located within a little used Ministry of Defence (MoD) low flying area and the turbines of the Operational Corkey Windfarm are being accommodated. The MoD will be consulted during planning but no objection is anticipated. It is noted that the MoD may request some infra-red turbine lighting to be installed on the turbines as part of the Development. While it is possible that visible obstacle lighting may be requested by civil aviation stakeholders, this is not required by law as only obstacles beyond the immediate surrounds (15 km) of an aerodrome which are in excess of 150 m are required to be lit under the Air Navigation Order.

79. It is proposed that turbines 1, 3 and 5 be lit with infra-red light compliant with MOD requirements, these turbines represent the peripheral/cardinal turbines of the Development. It should be noted that infra-red lights are not visible to the naked eye.

80. Therefore, potential effects on aviation as a result of the Development, allowing for infra-red lighting, will be negligible and are not considered further. The requirement for infra-red lighting, and details and positions of the proposed turbines can be secured via the use of an appropriately worded planning condition.

14.4.2 Consultation

81. Consultation with the relevant aviation organisations was initiated during the Scoping process, to identify any potential aviation issues that could be affected by the Development. The findings are summarised in **Table 14.6.**

Table 14.6: Summary of Consultation Responses on Aviation

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Ministry of Defence (MOD)	Email 27/09/2017	No safeguarding objections. MOD did request that turbines be fitted with aviation warning lights, either 25 candela red or infra-red, omni directional flashing lights fitted to the highest practicable point of the structure. The MOD also requested that details of the Development's turbines be notified to Defence Geographic Centre for charting and mapping purposes prior to their erection.	It is proposed that infra-red lighting will be installed on the top of the nacelle on the periphery/cardinal turbines. Turbines 1, 3 and 5 are proposed. Defence Geographic Centre will be notified of the relevant turbine details as requested by the MOD prior to erection.
Belfast International Airport	N/A	No Response to Scoping Request	

14.5 Human Health

14.5.1 Scope

82. As per the EIA Regulations and as agreed at Scoping, a Human Health Impact Assessment (HHIA) has been included as part of the overall EIA process. With respect to the Development, this draws together the findings of other assessments undertaken as part of the EIA process. This assessment has been supported by risk assessment carried out by MMI Thornton Tomasetti, (previously known as MMI Engineering), who specialise in a number of areas including: risk management; safety engineering; and structural engineering. MMI Thornton Tomasetti have a wide range of clients across a range of industrial sectors, which include commercial organisations, "duty holders", government bodies, industry bodies and regulatory organisations. (A "duty holder" is the person or body responsible for safety and for putting in place suitable procedures and measures to control the risks).

83. Limited Interactions with human health are possible, and consideration has been given to the findings of the following assessments:

- Traffic and Transportation (**Chapter 12: Access, Traffic and Transport**);
- Noise (**Chapter 10: Noise**);
- Residential Visual Amenity Assessment which accompanies this ES;
- Shadow Flicker (**Section 14.3** of this Chapter); and
- Health and Safety at Work including best practice.

84. The scope of the EIA in respect of Human Health was set out in **Technical Appendix A2.1 Scoping Report** and this was agreed by CCGBC in its scoping response, as noted in **Table 14.7**.

85. Properly designed and maintained wind turbines and associated infrastructure are a safe technology. As stated in **Technical Appendix A14.2 Health and Safety Statement** the site design and inbuilt buffers from sensitive receptors will minimise the risk to humans from the operation of the turbines. Risks associated with ice build-up, lightning strike and structural failure are removed or reduced through inbuilt turbine mechanisms in modern machines, and were scoped out of the assessment. Potential health impacts are therefore related primarily to decommissioning/construction related impacts, and operational impacts on residential amenity.

14.5.2 Assessment Methodology

86. The potential effects in this chapter have been identified through technical assessments in line with the best practice guidance detailed in **Section 14.5.2**.

87. The nature and magnitude of the potential effect will determine the people/population affected.

88. Significance is assessed as per the assessments drawn from those listed in **Section 14.5.1** above

89. Cumulative effects are considered in the assessments drawn from, and where relevant these are included in this section.

14.5.3 Guidance

90. Guidance presented within the Best Practice Guidance to PPS18: Renewable Energy states that:

91. *"Development that generates energy from renewable resources will be permitted provided that the proposal, and any associated building and infrastructure, will not result in an unacceptable adverse impact on:*

- *Public safety, human health, or recreational amenity."*

Further guidance has been taken from the Institute of Environmental Management Association (IEMA) (2017) Health in Environmental Impact Assessment. A Primer for a Proportionate Approach[12].and Health and Safety Executives Report entitled The Study and Development of a Methodology of the Estimation of the Risk and Harm to Persons from Wind Turbines[13].

14.5.4 Consultation

92. Consultation with the relevant organisations was initiated during the initial stages of the EIA to identify any human health effects that could be initiated by the Development. A summary of the findings are detailed in **Table 14.7.**

[12] IEMA (2017) Health in Environmental Impact Assessment. A Primer for a Proportionate Approach. [Online] Available at https://www.iema.net/assets/newbuild/documents/IEMA%20Primer%20on%20Health%20in%20UK%20EIA%20Doc%20V11.pdf [Accessed 09/01/2019]

[13] Health and Safety Executive, 2013, RR968, Study and development of a methodology for the estimation of the risk and harm to persons from wind turbines, Available Online at http://www.hse.gov.uk/research/rrpdf/rr968.pdf [Accessed May 2019]

Table 14.7: Summary of Consultation Responses on Human Health

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Causeway Coast and Glens Borough Council (CCGBC)	Letter 28/02/2018 in response to the Scoping Report	The council is content with the suggested approach regarding Human Health	None required
Causeway Coast and Glens Borough Council (CCGBC)	Meeting 24/05/2018	PPS18 Guidance note	None required

14.5.5 Assessment of Effects

93. The sections below summarise the human health effects on potential receptors identified in the relevant technical assessments referenced within **Section 14.5.1** of this Chapter.

14.5.5.1 Traffic and Transportation

94. The potential effect that traffic and transportation associated with the Development has on human health has been considered in **Chapter 12: Access, Traffic and Transport**.

14.5.5.1.1 Decommissioning/Construction Phase

95. A number of potential traffic effects are assessed in **Chapter 12: Access, Traffic and Transport**. Mitigation measures are both embedded in the design of the Development as discussed in **Chapter 4: Site Design**, and set out in **Chapter 12: Access, Traffic and Transport**, in order to reduce the traffic effects arising from the Development. The following are the key potential effects associated with access and traffic:

- Severance;
- Driver, pedestrian and cyclist delay and amenity; and
- Pedestrian amenity, fear and intimidation.

96. A road traffic collision (RTC) assessment was undertaken, as detailed in **Chapter 12: Access, Transport and Traffic**, **Section 12.4.5.** . It concluded that the temporary increase in overall traffic, and HGVs, for the duration of decommissioning /construction phases of the Development is not likely to result in an effect on accidents and safety. The effect on accidents and safety is considered to be negligible and **not significant** in terms of the EIA regulations.

97. Severance is the effect of splitting communities that exist on both sides of an access route, caused by increases in traffic levels. Severance was considered in **Chapter 12, Section 12.7.5.** It was concluded that the effect of severance during the decommissioning/construction phases is negligible and **not significant** in terms of the EIA Regulations.

98. **Section 12.7.4 of Chapter 12** considers the potential for the increase in traffic during the decommissioning/construction phases on the road network to lead to driver delays. It concludes that any delays will be infrequent and of short duration, and hence not significant.

99. Pedestrian amenity, fear and intimidation can be affected by changes to traffic flow and composition. The majority of routes within the Study Area do not have pedestrian footways, except where they pass through settlements, and it is considered unlikely that significant pedestrian traffic is present outside of settlements. The effect of increased traffic on pedestrian amenity on routes outside of settlements is therefore considered to be low and **not significant** in terms of the EIA regulations.

100. St Anne's Primary School is located in the settlement of Corkey and fronts directly on to the proposed HGV haul route, so there is a potential for a pedestrian amenity effect. Mitigation measures to minimise this effect are detailed in **Section** Error! Reference source not found. **of Chapter 12.** Following implementation of these measures, the effect of increased traffic on pedestrian amenity will be reduced to low and not significant in terms of the EIA Regulations.

14.5.5.1.2 Operational Phase

101. Traffic during the operational phase will consist of movement by staff that will supervise the operation of the Development and visit the Development to conduct routine maintenance. This is unlikely to involve HGVs and would be of negligible magnitude, and hence any related effects will not be significant.

14.5.5.2 Noise

102. A full assessment of the potential effects of noise and vibration is provided in **Chapter 10: Noise**.

14.5.5.2.1 Initial Decommissioning/Construction Phases

103. Noise and vibration effects during the initial decommissioning/construction phase were scoped out of the EIA as agreed by CCGBC, and a set of best practice measures to minimise effects is presented in **Chapter 10: Noise**.

14.5.5.2.2 Operational Phase

104. Operational Phase potential noise-sensitive receptors were identified in the vicinity of the Development. The potential for significant noise effects are limited to residential amenity in the local area caused by the operation of the proposed wind turbines, which reduces as the distance from the Development increases,

105. The effects of noise from the operation of the Development have been assessed using the methodology for assessing wind turbine noise recommended by the Northern Ireland Executive[14]. The existing levels of background noise were measured at a selection of representative properties situated in the vicinity of the Development, and their relationship to windspeed established. The measured background noise levels were corrected to exclude noise from existing operational wind turbines (including the Operational Corkey Wind Farm), following a methodology agreed with the Causeway Coast & Glens Borough Council.

106. Appropriate noise limits for the Development were derived, taking into account the cumulative effects of other wind energy developments in the locality, either in planning, consented or operational[15]. Noise levels due to the operation of the Development were predicted using a recognised calculation technique, compared to the noise limits, and found to be acceptable.

107. Therefore, all noise effects likely to arise from the Development were assessed as **not significant** in terms of EIA regulations.

108. As described In **Chapter 3: Development Description,** the Development includes Energy Storage Units. Based upon Arcus' substantial experience of such facilities, they emit relatively low levels of noise; the Energy Storage Unit is likely to comprise a number of containerised modules, with the primary noise source being the air conditioning units used to regulate the temperature of the storage system. Given this, coupled with the substantial (approximately 800 m) separation distance between the Energy Storage Unit and the closest noise-sensitive receptors, there is no reasonable prospect of a significant effect. This element has therefore not been considered further.

14.5.5.3 Residential Amenity

109. An assessment of residential visual amenity has been undertaken in **Chapter 6: Landscape and Visual, Section 6.8.1.3**

110. Residents are considered to be of high sensitivity to the Development as they are static 'receptors' whose enjoyment of the property is likely to be affected by the quality of visual amenity experienced there. The purpose of the Residential Visual Amenity Assessment (RVAA) is to inform the planning process. It is in this context that the Technical Guidance[16] makes the following statement: 'It is not uncommon for significant adverse effects on views and visual amenity to be experienced by people at their place of residence as a result of introducing a new development into the landscape. In itself this does not necessarily cause particular planning concern. However, there are situations where the effect on the outlook / visual amenity

[14] ETSU-R-97, The Assessment and Rating of Noise from Windfarms, ETSU for the DTI, 1996

[15] Excluding the effects of the Operational Corkey Wind Farm, which will be decommissioned.

[16] Landscape Institute (2019). Technical Guidance Note 2/19 'Residential Visual Amenity Assessment (RVAA)

of a residential property is so great that it is not generally considered to be in the public interest to permit such conditions to occur where they did not exist before.'

111. The Development would replace the Operational Corkey Windfarm and would be seen in context with the adjacent Gruig Windfarm. As such, the change in setting of local properties would be slight, consisting of views that already contain other wind turbines, a negligible magnitude of change. The effect on residential amenity is therefore considered to be negligible which is **not significant** in terms of EIA Regulations.

112. Significant visual change does not mean a significant effect on amenity. Application of the standard test, of whether the visual change would be such to render a property an unattractive place to live, found that no properties would be described as this, during any phase of the Development.

14.5.5.4 Shadow Flicker

113. An assessment of the potential effects of shadow flicker is provided in **Section 14.3** of this chapter.

114. No shadow flicker effects will occur during the initial decommissioning/construction phases.

115. The effect of shadow flicker has been assessed using appropriate guidance, on the three residential properties within 10 rotor diameters of the proposed turbine locations. Potential effects based on worst case model parameters, show a marginal exceedance of the guidance thresholds at 1 property, with all effects at two other properties being below the thresholds.

116. Cumulative shadow flicker effects have been identified at 1 property, 15 Reservoir Road. Information available from aerial imagery and photographs taken from site visits, shows that this has large windows on all sides of the extension, which is on the north eastern side of the house. Smaller windows are located on the main house building, but these face southeast rather than towards the Site. As a result, cumulative shadow flicker effects are likely to be much lower, and may not be experienced at all.

117. In the event that shadow flicker event occurs, mitigation can be deployed in the form of a series of measures following commencement of operation of the Development. These mitigation measures would reduce the effects or remove flicker affects entirely.

118. Any residual effects from shadow flicker would therefore be not significant in terms of the EIA Regulations.

14.5.5.5 Health and Safety

14.5.5.5.1 Decommissioning/Construction Phases

119. There are various health and safety considerations particularly for workers during the initial decommissioning/construction phases of the Development. Workers are in the closest proximity to the Development and as a result are considered to be the most at risk group.

120. Comprehensive health and safety assessments are an essential part of the construction process and would be carried out prior to the initial decommissioning/construction phases in accordance with legislation. A Construction, Design and Management (CDM) co-ordinator will be appointed and be responsible for the provision of a pre-decommissioning/construction phases information pack, as required under the Construction (Design and Management) Regulations (Northern Ireland) 2016. The appointed main contractor will be required to provide a construction phase plan.

121. The construction of the Development would be managed in accordance with the Health and Safety at Work (Northern Ireland) Order 1978 and would comply with all other relevant Health and Safety Regulations, including:

- Construction (Health, Safety and Welfare) Regulations (Northern Ireland) 1996;
- The Construction (Design and Management) Regulations (Northern Ireland) 2016; and
- The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012.

122. The Development would operate to the Health and Safety Executive 'Health and safety in the new energy economy: Meeting the challenge of major change' published in August 2010.

123. Following adoption of these measures, the risk to human health of decommissioning/construction workers is considered to be low and not significant in terms of the EIA Regulations.

14.5.5.5.2 Operational Phase

124. MMI Thornton Tomasetti, has assessed and evaluated the risk arising from the Development in accordance with HSE Report 968[13]. The findings of which are presented within **Technical Appendix TA14.2 Health and Safety Statement**. It is noted that "best practice" planning guidance in BPG Planning Policy Statement 18 "Renewable Energy", recommends a separation distance of 10 times rotor diameter to nearby occupied property. In light of this guidance and following a meeting with CCGBC in which the issue was raised, MMI were commissioned to undertake an assessment on the basis of site specific factors, taking account of recorded wind conditions and the wind turbine design proposed for the site, looking at the risk of blade throw and fragmentation risk, under a range of scenarios..

125. Based on this detailed analysis, it is concluded that the risks related to blade throw and fragmentation posed by the Development are well within the HSE defined "Broadly Acceptable" region and therefore no further mitigation is required. "Broadly Acceptable" is the lowest category of risk defined by the HSE and to provide further context, is the same order of magnitude as can be attached to the likelihood of a fatality from a lightning strike (1 in 18,700,000 fatalities per year in the UK).

14.5.5.6 Cumulative Effects

126. The above assessments include the potential for cumulative effects on each of the topic areas. It is possible that the interrelationship between two or more of the above effects, where they act on the same receptor, may lead to in-combination effects. These are assessed in the "Interrelationships" section in **of this chapter**.

14.5.6 Summary of Effects

127. Key determinants to the protection of human health, including mental health aspects associated with changes to amenity as a result of the Development, have been considered as part of this HHIA. The outcome of the HHIA indicates that the Development is unlikely to negatively affect people's health and wellbeing in its widest sense. There are no effects that:

- Cause potentially severe or irreversible negative effects;
- Affect a large number of people to an unacceptable level; or
- Specifically, may affect groups of people who already suffer poor health or are socially excluded to an unacceptable level.

128. As a result, no significant effects are predicted for any phases of the Development.

14.6 Climate Change

14.6.1 Scope

129. The aim of the Climate Change Impact Assessment (CCIA) section is to determine how the Development is likely to interact with a changing climate and whether any significant effects could arise. CCIA is a new form of environmental assessment required by the amended European Commission (EC) Directive 2014/52/EU[17] as transposed into the EIA Regulations.

130. The most recent climate projection iteration UK Climate Projections 2018 (UKCP18)[18], has identified the following climatic trends as a result of climate change:

- Increased temperatures;
- Sea level rise; and
- Change in the frequency, intensity and distribution of rainfall events (e.g. an increase in the contribution of winter rainfall from heavy precipitation events and decreases in summer rainfall).

[17] European Parliament and Council Directive 2014/52/EU amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment. ,

[18] Met Office (2018). UKCP18 Headline Findings. [online] Available at https://www.metoffice.gov.uk/research/collaboration/ukcp

131. As none of the identified climate change trends listed above could affect the Development, the Development's vulnerabilities and resilience to climate change has been scoped out of the EIA.

132. The assessment of the Development's effects on climate change has been scoped into the EIA, given the associated carbon reduction properties of windfarms and the potential for peat disturbance.

133. The scope of the EIA in respect of climate change was set out in **Technical Appendix 2.1 Scoping Report** and this was agreed by CCGBC in its scoping response, as noted in **Table 14.8.**

14.6.2 Assessment Methodology

134. The methodology uses the Scottish Government's Carbon Calculator Tool[19] to calculate the carbon savings and carbon losses over the lifetime of the Development. It provides a mechanism by which carbon costs of the Development can be weighed against the carbon savings associated with the operation of the Development during its lifetime. As the Development is proposed in perpetuity, an assumption of a 70-year lifespan has been made.

135. The data sources and assumptions used in the carbon balance assessment are detailed in **Technical Appendix A14.1: Carbon Calculator Inputs and Outputs**.

136. The assessment is a comparative one, comparing the effects on carbon with and without the proposed Development.

14.6.3 Guidance

137. In order to establish a comprehensive assessment methodology, the following guidance has been followed:

- The Institute of Environmental Management and Assessment (IEMA) guidance document 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaption' (2015)[20];
- The IEMA guidance document 'Environmental Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance' (2017)[21]; and
- European Commission 'Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment' (2013)[22].

14.6.4 Consultation

138. Consultation with the relevant organisations was initiated during the initial stages of the EIA to identify any climate change effects that could be initiated by the Development. A summary of the findings is detailed in **Table 14.8.**

Table 14.8: Summary of Consultation Responses on Climate Change

Consultee	Type and Date	Summary of Consultation Response	Response to Consultee
Causeway Coast and Glens Borough Council (CCGBC)	Letter 28/02/2018 in response to the Scoping Report	The council is content with the proposed CCIA methodology, the guidance and data sources referred.	None required

14.6.5 Assessment of Effects

139. The following section discusses the results of the Scottish Government's Carbon Calculator Tool when applied to the Development. **Technical Appendix A14.1: Carbon Calculator Inputs and Outputs** provides the full set of inputs and results produced by the Tool.

14.6.5.1 Carbon Savings

140. Every unit of electricity produced by a windfarm development displaces a unit of electricity which would otherwise have been produced elsewhere. The mix of electricity generation produced in the UK includes coal, oil and gas fired generation, and therefore displacing this represents carbon savings.

141. The electricity produced from the Development is assumed to substitute energy production by entirely coal-fired generation, or a mix of fossil fuels, or the national grid mix of energy generation. A renewable energy development would have a maximum potential to save carbon emissions when substituting coal fired generation. However, it is not appropriate to define the electricity source for which this renewable electricity project would substitute due to uncertainty in future grid mix. As a result, carbon emission savings are calculated for each scenario in the carbon calculator (see **Technical Appendix A14.1: Carbon Calculator Inputs and Outputs**).

142. Carbon savings for the expected scenario are summarised in **Table 14.9**. Carbon savings are expressed in terms of tonnes of carbon dioxide (CO_2).

Table 14.9: Carbon Savings for the Development (Expected Scenario)

	Expected CO_2 Saving (t CO_2yr^{-1})
Coal fired electricity generation	49,537
Grid mix electricity generation	15,157
Fossil fuel mix electricity generation	24,822

14.6.5.2 Carbon Losses

143. The manufacturing, construction and installation of the wind turbines have an associated carbon cost, and carbon losses are also generated by the requirement for extra capacity to back up wind generation. Carbon losses associated with reduced carbon fixing potential and loss of soil organic matter may occur through excavation of peat for construction and drainage effects. Carbon losses may also be associated with felling of existing forestry; however, as no forestry is present on Site, this does not apply to this Development.

144. Peat-forming vegetation that leads to organic soils (peatlands) act as carbon sinks, whereby they absorb carbon dioxide and release it due to land use change. Windfarm developments on peatland may result in negative effects on these habitats if not appropriately considered during scheme design and development. Changes to the peatland habitat through development could result in a significant effect on its ability to store carbon, potentially resulting in reduced carbon benefits of the Development.

145. The proposed Development layout was determined through an iterative design process which involved careful consideration of the distribution of active peat across the Site, with a focus on the reuse of existing infrastructure wherever possible, to minimise disturbance of active peat.

146. Carbon losses for the expected scenario are summarised in **Table 14.10.**

Table 14.10: Carbon Gains and Losses for the Development (Expected Scenario)

Loss / Gain	t CO_2 Equivalent (total for windfarm lifetime)
Losses due to turbine life (e.g. manufacture, construction, decommissioning)	17,044
Losses due to back-up	16,118
Losses due to carbon fixing potential	282

[19] Scottish Government, 2016, Calculating Carbon Savings from Wind Farms on Scottish Peatlands - A New Approach [Online] Available at: http://informatics.sepa.org.uk/CarbonCalculator/
[20] IEMA (2015) IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation [Online] Available at: https://www.iema.net/assets/templates/documents/iema_guidance_documents_eia_climate_change_resilience_and_adaptation%20(1).pdf
[21] IEMA (2017) IEMA Environmental Impact Assessment Guide to Assessing Greenhouse Gas Emissions and Evaluating their Significance' [Online] Available at: https://www.iema.net/policy/ghg-in-eia-2017
[22] European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment. Available at http://ec.europa.eu/environment/eia/pdf/EIA%20Guidance.pdf

Loss / Gain	t CO_2 Equivalent (total for windfarm lifetime)
Losses from soil organic matter	4,278
Losses due to Dissolved Organic Carbon (DOC) and Particulate Organic Carbon (POC)	266
Change in emissions due to improvement of degraded bogs	-816
Change in emissions due to removal of drainage from foundations & hardstanding	-344
Net Emissions of Carbon Dioxide	**36,829**

14.6.5.3 Payback Period

147. The carbon payback period is a measurement/indicator to help assess a proposal. The shorter the payback the greater the benefit the Development will have in displacing emissions associated with electricity generated by burning fossil fuels.

148. The payback period is calculated taking the total carbon cost (carbon losses) and dividing by the annual carbon gains from displaced fossil fuel power generation and any site improvements.

149. The estimated payback period for the Development is 2.4 years compared to grid-mix electricity generation. In comparison to fossil fuel mix and coal fired electricity generation, the payback period of the Development reduced to 1.5 years and 0.7 years respectively. **Table 14.11** goes into further detail on payback periods for the Development.

Table 14.11: Payback in years for each scenario used in the Carbon Calculator

Compared to…	Expected Scenario	Best Case Scenario	Worst Case Scenario
Coal fired electricity generation	0.7	0.3	1.5
Grid mix electricity generation	2.4	1	5
Fossil fuel mix electricity generation	1.5	0.6	3

150. On this basis, the CO_2 emissions of the Development are forecast to be cancelled out within c. 2.4 years. The CO_2 emissions savings for the operational lifetime beyond that would be a positive net benefit of the Development to reducing climate change. No time limit has been assumed for the operational phase of the Development, and all operation beyond the payback time represents a benefit in terms of net reduction of carbon emissions. The longer the Development operates, the greater the benefit. The Development will have a moderate (and significant) beneficial effect on carbon emission savings which increases proportionally with the duration of the operational phase.

14.6.6 Cumulative Effects

151. The UK Government has set ambitious targets for reducing greenhouse gas emissions by 2050 as part of the UK Climate Change Act 2008[23]. The legally binding targets are for a reduction of at least 80% by 2050 against the 1990 baseline. Whilst Northern Ireland does not have any separate climate change legislation, any emissions produced in Northern Ireland and hence any reductions in emissions will contribute to the UK's overall total and therefore Northern Ireland has a role to play in meeting the legally binding targets.

152. Table 5.3 of the Digest of UK Energy Statistics 2018[24] report details the sources used in generation of electricity throughout 2017 by major power producers. Renewable electricity represented 29.3% of total UK generation in 2017 with onshore wind having the highest share of renewable capacity and generation (at 31.7% and 29% respectively). 10.2% of total energy consumption came from renewable sources, as detailed within Table 6.7 of DUKES 2018[25]. The Development will contribute around 20 MW of further installed capacity.

153. The cumulative effect of the Development with other UK renewables generation is considered to be a fundamental change in the climate effects of UK energy supply, which is a major, positive, effect that is significant under EIA Regulations and will contribute to the UK's legally binding emission reduction targets.

14.6.7 Mitigation Measures and Residual Effects

154. Sections 14.6.5.3 and 14.6.6 identify positive effects that are moderate and major respectively. Through the iterative design process, these positive effects have been maximised. As a result, the residual effects are as assessed above.

14.6.8 Summary of Effects

155. The Development will have a significant positive effect on carbon savings in isolation and a significant positive effect when considered cumulatively with UK-wide renewable energy deployment.

14.7 Interrelationship Effects

156. Schedule 4, Part 1, paragraph 3 of the EIA Regulations requires that the ES considers the interrelationships between aspects of the environment likely to be significantly affected by a development.

157. Interrelationships may occur where two or more effects arise that have the potential to have an effect on the same receptor during any particular phase of a development. An effect taken in isolation may not have a significant effect on a receptor, but where several effects are considered in an interrelated manner, the resultant combined effect may be considered significant, depending on the nature of the effects.

158. Typically, where one individual effect dominates, the assessment focuses on whether the addition of other effects on that receptor would make a material difference. Where individual effects are similar in magnitude, the assessment focuses on whether the combined effect could be significant.

14.7.1 Methodology

159. Residual effects assessed as "negligible" (with a magnitude described generally as "no detectable or material change", or "a barely discernible change") in other chapters of this ES are considered not to have the potential to contribute to interrelationship effects, and are not considered in this assessment. For the avoidance of doubt, all effects not explicitly assessed elsewhere in the ES are considered to be negligible and are therefore not assessed.

160. Only receptors that are predicted to be the subject of more than one potential effect have been included in the assessment. Receptors predicted to be the subject of only a single effect are excluded because there is considered to be no potential for a cumulative interrelationship effect to take place.

161. The rationale for receptor inclusion or exclusion has been explicitly detailed in **Section 14.7.2**.

162. A matrix has been used to detail which potential effects from different sources are predicted to impact each of the included receptors.

163. It should be noted that uncertainty in the assessment of effects, for most of the technical chapters in this ES, is dealt with by making conservative, or worst-case, assumptions. As this assessment considers the "in-combination" effects of multiple individual effects, it is based on there being multiple worst-cases simultaneously, which in turn is likely to be overly conservative.

164. There are no specific guidelines on how the assessment of interrelationship effects should be undertaken, and so a qualitative approach has been used, using the results of the individual assessments, and based on professional judgement. Note that the

[23] UK Government (2008) UK Climate Change Act 2008. Available at http://www.legislation.gov.uk/ukpga/2008/27/part/1/crossheading/carbon-budgeting
[24] Department for Business, Energy & Industrial (2018) Digest of United Kingdom Energy Statistics (DUKES) (2018) [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/695804/Renewables.pdf
[25] Department for Business, Energy & Industrial (2018) Digest of United Kingdom Energy Statistics (DUKES) (2018) [Online] Table 6.7. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/736153/Ch6.pdf

assessment of the interaction effect may come to a different conclusion than the effect on the individual topic, as it is the combination of effects that are being assessed.

165. The sensitivity of receptors has been assessed as set out in the individual **Chapters 6 to 13** of this ES, and therefore residents are considered to have a high sensitivity, although noting that this will be somewhat diminished by the presence of an Operational Corkey WindFarm in the baseline scenario. In-combination effects of moderate or major magnitude have been assessed as significant, based on professional judgement. Magnitude has been assessed in accordance with the generic guidance in **Chapter 2: Environmental Impact Assessment Methodology**, which describes magnitude as:

- Negligible- no detectable change to a location, environment, species or sensitive receptor;
- Minor- a detectable but non-material change to a location, environment, species or sensitive receptor;
- Moderate- a material, but non-fundamental change to a location, environment, species or sensitive receptor; and
- Major- a fundamental change to a location, environment, species or sensitive receptor.

14.7.2 Effect Interrelationship Matrix

166. A matrix, **Table 14.12**, has been used to detail which potential residual effects are predicted to impact each of the included receptors. Receptors are grouped at this stage to provide focus.

167. It is noted that noise effects (**Chapter 10**) are not sub-categorised into Negligible, Minor, Moderate and Major, and hence "not significant" effects could potentially contribute to interrelationship effects. Where residential properties lie within the 35 dB noise contour (the lower end of the range of daytime fixed lower noise limits as specified in reference guidance; in **Chapter 10, Sections 10.2.2.3 and 10.3.8.1**) as shown on **Figure 10.2**, these are included below.

168. **Table 14.12** below identifies the potential relationships between the effects in one chapter and receptors in another, considered in this ES. For some interrelationships, the in-combination effects are already described within individual chapters, as noted in **Table 14.12**. Other interrelationships are not described anywhere else in the ES, and are assessed below.

Table 14.12: Potential interrelationships between ES chapters

Chapter		6	7	8	9	10	11	12	13	14
	Title	Landscape and Visual Amenity	Hydrology, Hydrogeology and Geology	Ecology	Ornithology	Noise	Cultural Heritage	Access, Traffic and Transport	Socio-Economics, Tourism and Recreation	Other Issues
6	Landscape and Visual Amenity	N/a	-	-	-	Residents	In Ch. 11	Residents	In Ch. 13	-
7	Hydrology, Hydrogeology and Geology		N/a	In Ch. 8	In Ch. 9	-	-	-	-	In Ch. 14
8	Ecology			N/a	In Ch. 9	-	-	-	-	-
9	Ornithology				N/a	In Ch. 9	-	-	-	-
10	Noise					N/a	-	In Ch. 10	In Ch. 13	-
11	Cultural Heritage						N/a	-	-	-
12	Access, Traffic and Transport							N/a	-	-
13	Socio-Economics, Tourism and Recreation								N/a	-
14	Other Issues									N/a

14.7.3 Residential Receptors

169. The only potential interrelationship effects not already assessed in other chapters of this ES relate to the potential effects on residents.

170. Potential effects on residents during the initial decommissioning / construction phases include:

- Changes in their visual environment because of the visibility of the decommissioning/construction activity (**Chapter 6: LVIA, Section 6.8.1.2**); and
- Changes in the traffic on the decommissioning/construction routes leading to changes in pedestrian amenity, severance, vibration and driver delay (**Chapter 12: Access, Traffic and Transport, Sections 12.7.3, 12.7.4 and 12.7.5**).

171. Potential effects on residents during the operational phase include:

- Changes in their visual environment due to the fewer but taller turbines (**Chapter 6: LVIA, section 6.8.1.2**); and
- Changes in the noise environment because of changes to noise conditions resulting from the proposed turbines (**Chapter 10: Noise**).

172. Specific receptors that were identified in each of these chapters are detailed in **Table 14.13** for the initial decommissioning/ construction phase effects and **Table 14.14** for operational phase effects.

Table 14.13: Non-negligible initial decommissioning/ construction phase effects arising in two or more chapters

Chapter / effect type	Receptor	Magnitude
6: Visual	Residents of properties within 5.5 km	Medium to High
12: Pedestrian amenity	Residents within Corkey	Low
12: Driver delay	Drivers along the haul route	Low
12: Severance	Residents within Corkey	Low
12: Vibration	Residents along the construction route	Low

Table 14.14: Non-negligible operation phase effects arising in two or more chapters

Chapter / effect type	Receptor	Magnitude
6: Visual	Residents of properties within 5.5 km	Medium to High
10: Noise	Residents of 15, 21 and 42 Reservoir Road	Within the 35 dB contour

173. The above effects have been set out for each receptor in **Table 14.15.**

Table 14.15: Non-negligible interrelationship effects by receptor

Receptor	Initial Decommissioning/ Construction Phases	Operational Phase
Residents of 15, 21 and 42 Reservoir Road	Visual effects Driver delay Vibration	Visual effects Increased turbine noise
Residents of Corkey	Visual effects Pedestrian amenity Driver delay Severance Vibration (for receptors along haul route)	None
Other residents within 5.5 km	Visual effects Driver delay Vibration (for receptors along haul route)	None

14.7.4 Assessment of Effects

174. This section considers the effects of the interrelationship between the individual effects identified in **Table 14.15** for each receptor or receptor group.

14.7.4.1 Residents of 15, 21 and 42 Reservoir Road

175. During the initial decommissioning/ construction phases, the high magnitude visual effects at these 3 properties (**Chapter 6: LVIA, Section 6.8.1.3**) and their environs are likely to be the greatest change in experience of living at these properties. Other potential effects are the low magnitude potential driver delay associated with the movement of abnormal loads (**Chapter 12: Access, Traffic and Transport, Section 12.7.4**) and low magnitude possible airborne vibration associated with movements of HGVs if passing close to properties (**Chapter 12: Access, Traffic and Transport, Section 12.7.6)**. As noted in that section, these will be delivered over a 2-month period, and comprise c. 40 vehicle movements. A delay would be realised only if a resident was travelling on the same roads at the same time as an abnormal load. As a result, short-term driver delay effects are unlikely to add substantially to the visual effect. All three properties on this road are set well back from the road, and in open areas that allow airborne vibration to disperse. As a result, airborne vibration from vehicle movements at these three properties is expected to be negligible. The difference between the visual effects and the overall change when added to a potential driver delay effect is expected to be a detectable, short term, but non-material change (as a worst-case), and so is assessed as minor, and not significant.

176. During the operational phase, the visual effects at these three properties and their environs is associated with the increase in height of the proposed turbines at the Development, this is likely be the greatest change in experience of living at these properties. The Operational Corkey Windfarm and Gruig Windfarm may have the potential to influence background noise levels in the locality (as stated in **Chapter 10: Noise, Section 10.4**). The assessed operational noise scenario was found to be compliant with noise limits and not a significant effect. In addition to this, the baseline scenario includes the Operational Corkey Windfarm and a certain level of baseline wind turbine noise will be present currently, reducing the magnitude of change (this is not considered in Chapter 10 in accordance with topic-specific guidance). As a result, changes in noise effects are very unlikely to contribute substantially to the overall effect. The difference between the visual effects and the overall change when added to a potential increase in wind turbine noise is expected to be a detectable, short term, but non-material change, and so is assessed as minor, and not significant.

14.7.4.2 Residents of Corkey

177. During the decommissioning/ construction phases, the high magnitude visual effects from Corkey (**Chapter 6: LVIA, Section 6.8.1.3**) and their environs are likely to be the greatest change in experience of living at these properties. Other potential effects are associated with potential driver delay associated with the movement of abnormal loads (**Chapter 12: Access, Traffic and Transport, Section 12.7.4**), potential pedestrian amenity effects (**Chapter 12: Access, Traffic and Transport, Section 12.7.3**), severance (**Chapter 12: Access, Traffic and Transport, Section 12.7.5**) due to increased road traffic through Corkey and airborne vibration at properties along the haul route from HGVs associated with construction (**Chapter 12: Access, Traffic and Transport, Section 12.7.6)**. As noted in that chapter, abnormal loads will be delivered over a 2-month period, and comprise c. 40 vehicle movements per month. A delay would be realised only if a resident was travelling on the same roads at the same time as an abnormal load. As a result, short-term driver delay effects are unlikely to add substantially to the visual effect. Potential effects on pedestrian amenity are proposed to be mitigated through implementation of a Traffic Management Plan (TMP) as set out in **Chapter 12: Access, Traffic and Transport, Section 12.9.2**. These measures would also mitigate effects of severance of Corkey by increased traffic. Airborne vibration from passing HGVs could affect a small number of properties (c. 10) in Corkey in close proximity to the haul route. These effects, if they occur at all, would be highly localised, short-term in nature and limited to when HGVs pass. The difference between the visual effects and the overall change when added to a potential driver delay effect, localised airborne vibration and a mitigated pedestrian amenity and severance effect is expected to be a detectable short term, but non-material change (as a worst-case), and so is assessed as minor, and not significant.

14.7.4.3 Other residents within 5.5 km

178. During the decommissioning/ construction phases, the medium to high (depending on location) magnitude visual effects at residential properties within 5.5 km of the Site (**chapter 6, section 6.10**) are likely to be the greatest change in experience of living at these properties. Other potential effects are associated with potential driver delay associated with the movement of abnormal loads (**Chapter 12: Access, Traffic and Transport, Section 12.7.4**). As noted in that section, these will be delivered over a 2-month period, and comprise c. 40 vehicle movements. A delay would be realised only if a resident was travelling on the same roads at the same time as an abnormal load, which is statistically likely to be the case for only a very small proportion of residents within 5.5 km of the Site. As a result, short-term driver delay effects are unlikely to add substantially to the visual effect. Airborne vibration from passing HGVs could affect a small number of properties (c. 10) in Corkey in close proximity to the haul route. These effects, if they occur at all, would be highly localised, short-term in nature and limited to when HGVs pass. The difference between the visual effects and the overall change when added to a potential driver delay effect is expected to be a detectable, short term, but non-material change (as a worst-case), and so is assessed as minor, and not significant.

14.7.5 Summary of Interrelationship Effects

179. Non-negligible effects of the Development identified in more than one chapter of this ES, acting on a single receptor and excluding those effects already assessed elsewhere in this ES (such as visual and noise effects on recreational receptors, which are assessed in **Chapter 13**), have the potential to cause interrelationship effects. These have been identified as acting on nearby residents, as a result of visual and traffic effects during the decommissioning/ construction phases, and visual and noise effects of the operational phase of the Development. These have been assessed and found to be, in all cases, detectable, short term, but non-material changes (as a worst-case), and so are assessed as minor, and not significant in terms of the EIA Regulations.

14.8 Statement of Significance

180. The Development will have no significant effects on aviation, telecommunications, television reception, shadow flicker, or human health.

181. The Development will have a positive, and significant, effect on carbon savings, by displacing electricity generation from other sources that emit carbon dioxide.. The cumulative effect of the Development with other UK renewables generation is considered to be a fundamental change in the climate effects of UK energy supply, which is a major, positive, effect that is significant under EIA Regulations and will contribute to the UK's legally binding emission reduction targets.

182. In-combination effects associated with the interrelationships between effects assessed in other ES chapters that could act on a single receptor have been assessed as being not significant.

15 Summary of Effects and Mitigation

15.1 Introduction

1. This chapter of the Environmental Statement (ES) summarises mitigation measures proposed elsewhere in this ES.

2. Chapters 6 to 14 of the ES report the findings of the assessments of the predicted effects of the Development on a topic-by-topic basis. The significance of these effects has been assessed using criteria defined in the topic chapters. Where appropriate, the significance of effects has been categorised as major, moderate, minor or negligible. In the context of The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 (the EIA Regulations)[1], effects assessed as being of 'major' or 'moderate' significance are considered to be significant effects. For some of the assessments, effects are either considered to be significant or not significant in the context of the EIA Regulations, without sub-categorising.

15.2 Summary of Mitigation Measures

3. **Table 15.1** summarises the predicted significant effects of the Development prior to, and following, the implementation of committed mitigation measures**,** to which the Applicant is committed, as proposed in order to reduce or eliminate significant adverse environmental effects. Only effects assessed as significant, prior to mitigation, are shown in this table. Summaries of all significant and non-significant effects can be found at the end of each assessment chapter.

15.3 Embedded Mitigation

4. Embedded mitigation includes design changes that were made in order to reduce or eliminate adverse effects, as well as normal good practice measures, and these have avoided the majority of potentially significant effects. Embedded mitigation is considered in the "Predicted Effect" column in Table 15.1, and is not treated as "Mitigation" for these purposes. These are set out in the following locations in the ES, and details are not repeated here:

- **Chapter 3: Development Description**;
- **Technical Appendix A3.1: Outline Decommissioning and Construction Environment Management Plan** (Outline DCEMP);
- **Technical Appendix A7.2: Water Construction and Environmental Management Plan** (Outline WCEMP); and
- **Technical Appendix A3.2: Draft Habitat Management Plan** (HMP).

5. The process of applying the embedded mitigation is set out in **Chapter 4: Site Selection and Design**. The key design aspects comprising embedded mitigation are:

- The avoidance of inconsistent turbine spacing leading to relatively large gaps, outliers and excessive turbine overlapping to minimise visual confusion and ensure a balanced/compact array from key views;
- Achieving an appropriate scale of turbine, taking account of the landscape context;
- The utilisation of existing infrastructure, reuse of existing access roads and utilisation of the same general area/footprint of the Operational Corkey Windfarm;
- Understanding and respecting the ground conditions and topography of the Site, including avoiding effects on active peat where possible;
- Maximising the separation from residential dwellings; and
- Respecting other environmental constraints and associated buffer separations.

15.4 Specific Mitigation Measures

6. In addition to mitigation proposed to address significant adverse effects, as shown in **Table 15.1**, certain chapters have also proposed further measures to reduce effects that were assessed as not significant before mitigation. These are set out in **Table 15.2**.

Table 15.1: Summary of Significant Effects and Associated Mitigation Measures

Chapter	Receptor	Predicted Effect	Significance prior to Mitigation	Mitigation	Residual Effect
Decommissioning/Construction Phase					
Chapter 6: Landscape and Visual	Immediate Landscape Setting: Moyle Moorlands and Forests LCA (localised parts only)	Landscape change	Significant	None available	Significant
	Local Landscape Setting: Moyle Moorlands and Forests LCA (localised parts only)	Landscape change	Significant	None available	Significant
	Local Landscape Setting: Cullybackey and Clogh Mills Drumlins (localised parts only)	Landscape change	Significant	None available	Significant
	Local Landscape Setting: Central Ballymena Glens (localised parts only)	Landscape change	Significant	None available	Significant
	Antrim Coast and Glens AONB (localised parts only)	Landscape change	Significant	None available	Significant
	Viewpoint 1: Corkey	Visual change	Significant	None available	Significant
	Viewpoint 2: Lislaban	Visual change	Significant	None available	Significant

[1] The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017. Available online at: https://www.legislation.gov.uk/nisr/2017/83/contents/made [Accessed 16/10/2017]

Chapter	Receptor	Predicted Effect	Significance prior to Mitigation	Mitigation	Residual Effect
	Viewpoint 3: Reservoir Road	Visual change	Significant	None available	Significant
	Viewpoint 4: Loughgiel	Visual change	Significant	None available	Significant
	Viewpoint 5: Altnahinch Road south	Visual change	Significant	None available	Significant
	Viewpoint 6: Altnahinch Reservoir	Visual change	Significant	None available	Significant
	Viewpoint 7: Slieveanorra	Visual change	Significant	None available	Significant
	Viewpoint 11: Ballyweeny, Ballyveely Road	Visual change	Significant	None available	Significant
	Viewpoint 12: Altnahinch Road north	Visual change	Significant	None available	Significant
	Viewpoint 14: Kilmandil Road	Visual change	Significant	None available	Significant
	Moyle Way (localised parts only)	Visual change	Significant	None available	Significant
Chapter 11: Cultural Heritage	Unknown (buried) archaeological remains	Damage or destruction to unknown (buried) archaeology should they occur within Development footprint	Minor/Moderate	Watching brief in undisturbed portions of the Development footprint only.	Minor/Moderate but preserved via record
Chapter 12: Access, Traffic and Transport	Pedestrians at St Anne's school, Corkey	Pedestrian amenity effect associated with an increase in traffic along Reservoir Road	Major	A number of mitigation measures are proposed which are recommended for adoption in the Traffic Management Plan (TMP) to be agreed with consultees following consent: • As far as reasonably possible deliveries should be scheduled outside of school opening and closing times; • Where deliveries are required to take place during school opening and closing times these should be routed via the Abnormal Load Vehicle delivery route through Armoy, in order to avoid passing through Corkey; • Drivers of all delivery vehicles to be made aware during induction of the presence of schools within these settlements and that formal pedestrian crossing facilities are not present; and • Corkey has a 30-mph speed limit. Drivers to be made aware of this during induction and reminded that strict adherence to this is expected.	Not significant
Operational Phase					
Chapter 6: Landscape and Visual	Immediate Landscape Setting: Moyle Moorlands and Forests LCA (localised parts only)	Landscape change	Significant	None available	Significant
	Local Landscape Setting: Moyle Moorlands and Forests LCA (localised parts only)	Landscape change	Significant	None available	Significant
	Local Landscape Setting: Cullybackey and Clogh Mills Drumlins (localised parts only)	Landscape change	Significant	None available	Significant
	Antrim Coast and Glens AONB (localised parts only)	Landscape change	Significant	None available	Significant
	Viewpoint 1: Corkey	Visual change	Significant	None available	Significant
	Viewpoint 2: Lislaban	Visual change	Significant	None available	Significant
	Viewpoint 3: Reservoir Road	Visual change	Significant	None available	Significant
	Viewpoint 4: Loughgiel	Visual change	Significant	None available	Significant
	Viewpoint 5: Altnahinch Road south	Visual change	Significant	None available	Significant
	Viewpoint 6: Altnahinch Reservoir	Visual change	Significant	None available	Significant

Chapter	Receptor	Predicted Effect	Significance prior to Mitigation	Mitigation	Residual Effect
	Viewpoint 7: Slieveanorra	Visual change	Significant	None available	Significant
	Viewpoint 11: Ballyweeny, Ballyveely Road	Visual change	Significant	None available	Significant
	Viewpoint 12: Altnahinch Road north	Visual change	Significant	None available	Significant
	Viewpoint 14: Kilmandil Road	Visual change	Significant	None available	Significant
	Moyle Way (localised parts only)	Visual change	Significant	None available	Significant
Chapter 14: Other Issues	Residential dwelling (15 Reservoir Road)	Shadow flicker	Potentially Significant	Several forms of mitigation for shadow flicker are available, including: • Control at Receptor: the provision of blinds, shutters or curtains to affected properties; • Control on Pathway: for example screening planting close to an affected property; and • Control at Source: for example shutdown of turbines at times when effects occur.	Not significant
	The climate	Reduction in emissions of greenhouse gases	Significant, beneficial	None; the benefit was maximised through the design process.	Significant, beneficial

Table 15.2: Summary of Mitigation Measures for Non-Significant Effects

Chapter	Receptor	Predicted Effect	Significance prior to Mitigation	Mitigation	Residual Effect
Decommissioning/Construction Phase					
Chapter 9: Ornithology	Bird Species	Disturbance	Minor - Negligible	Implementation of Construction Management Strategy with particular regard for Snipe, Red Grouse, Meadow Pipit, skylark and small passerines	Negligible
	Bird Species	Displacement	Minor - Negligible	Implementation of Construction Management Strategy with particular regard for Snipe, Red Grouse, Meadow Pipit, skylark and small passerines Maintenance of the embedded set back distances >500m	Negligible
Chapter 10: Noise	Residential Properties	Decommissioning/Construction noise	Negligible	The good practice measures detailed below will be implemented to manage the effects of noise and will be required of all contractors: • Operations shall be limited to times agreed with CCGBC; • Deliveries of turbine components, plant and materials by HGV to site shall only take place by designated routes and within times agreed with CCGBC; • The site contractors shall be required to employ the best practicable means of reducing noise emissions from plant, machinery and activities, as advocated in BS 5228; • Where practicable, the work programme will be phased, which would help to reduce the combined effects arising from several noisy operations; • Where necessary and practicable, noise from fixed plant and equipment will be contained within suitable acoustic enclosures or behind acoustic screens; • All sub-contractors appointed by the main contractor will be formally and legally obliged, and required through contract, to comply with all environmental noise conditions; • Where practicable, night-time working will not be carried out. Local residents shall be notified in advance of any night time construction activities likely to generate significant noise levels, e.g., turbine erection; and • Any plant and equipment normally required for operation at night (23:00 - 07:00), e.g., generators or dewatering pumps, shall be silenced or suitably shielded to ensure that the night-time lower threshold of 45 dB, LAeq,night shall not be exceeded at the nearest noise-sensitive receptors.	Not significant
Chapter 12: Access, Traffic and Transport	Traffic flow at the site access junction, Reservoir Road	Slowing traffic due to vehicles accessing the site	Not assessed (because it was not a likely significant effect)	Appropriate warning signage is proposed to be installed on Reservoir Road on approach to the Site entrance junction in order to warn approaching drivers of the possibility of vehicles at the junction. The use of signage will also be used on Reservoir Road within the vicinity of the junction to advise drivers that they should be anticipating the need to slow down, which should also better facilitate two-way traffic flow. Liaison with the local community will be regularly undertaken to ensure that residents are advised of any	Not significant

				peak decommissioning / construction traffic activity and the proposed timings of any traffic movements associated with the delivery of the turbine components, this will form part of the Traffic Management Plan (TMP).	
Chapter 13: Tourism, Recreation, Land Use and Socio-economics	Local economy	Opportunities for local suppliers to be engaged in the construction process	Minor, beneficial	SPR will seek to secure positive benefits for the local/regional economy by encouraging the use of local labour, manufacturers and suppliers were possible. SPR will hold 'Meet the Developer days' prior to construction to allow local contractors to engage with the process and maximise opportunities	Minor (temporary positive)
Operational Phase					
Chapter 9: Ornithology	Bird Species	Displacement	Minor – Negligible, beneficial	The HMP will be beneficial to Hen Harrier, Merlin, Snipe, Red Grouse, Meadow Pipit, Skylark and Small Passerines	Negligible
	Bird Species	Collision Risk	Minor – Negligible	Maintenance of the embedded set back distances >500m Removal of carrion in order to minimise collision risk and prevent raven, gull and buzzard potentially being drawn into the Site for foraging. Raven and buzzard and kestrel perch management including removal of the existing lattice structure met mast on Operational Corkey Windfarm used for perching ravens	Negligible