

Environmental Impact Assessment Report

Carnsore Wind Farm, Co.
Wexford

Volume 1: Non-Technical
Summary and EIAR Chapters





DOCUMENT DETAILS

Client: **Hibernian Wind Power Ltd.**

Project Title: **Carnsore Wind Farm, Co. Wexford**

Project Number: **210202**

Document Title: **Environmental Impact Assessment Report (EIAR)**

Document File Name: **EIAR F – 2021.07.26 - 210202**

Prepared By: **MKO
Tuam Road
Galway
Ireland
H91 VW84**



Rev	Status	Date	Author(s)	Approved By
01	Final	07.27.2021	TB, EH	MW

Table of Contents

TABLE OF CONTENTS.....	i
TABLE OF TABLES.....	x
TABLE OF FIGURES.....	xiv
TABLE OF PLATES.....	xvi
NON-TECHNICAL SUMMARY.....	xvii
1. INTRODUCTION	1-1
1.1 Introduction.....	1-1
1.2 Legislative Context	1-4
1.2.1 Environmental Impact Assessment	1-4
1.2.2 EIAR Guidance.....	1-5
1.2.3 Wind Energy Development Guidelines for Planning Authorities.....	1-5
1.3 The Applicant.....	1-6
1.4 Brief Description of the Proposed Development.....	1-6
1.4.1 References to Proposed Development.....	1-7
1.5 Need for the Proposed Development	1-7
1.5.1 Overview	1-7
1.5.2 Climate Change and Greenhouse Gas Emissions.....	1-8
1.5.3 Energy Security.....	1-9
1.5.4 Competitiveness of Wind Energy	1-10
1.5.5 EU 2020 Renewable Energy Targets.....	1-10
1.5.6 EU 2030 Renewable Energy Targets.....	1-11
1.5.7 Reduction of Carbon Emissions and Other Greenhouse Gases	1-11
1.5.8 Economic Benefits.....	1-12
1.6 Purpose and Scope of the EIAR.....	1-13
1.7 Structure and Content of the EIAR.....	1-14
1.7.1 General Structure	1-14
1.7.2 Description of Likely Significant Effects and Impacts.....	1-14
1.8 Project Team.....	1-17
1.8.1 Project Team Responsibilities.....	1-17
1.8.2 Project Team Members	1-19
1.9 Difficulties Encountered.....	1-24
1.10 Viewing and Purchasing of the EIAR.....	1-24
2. BACKGROUND TO THE PROPOSED DEVELOPMENT	2-1
2.1 Renewable Energy Policy and Targets	2-1
2.1.1 Renewable Energy Resources	2-1
2.1.2 EU Policy and Targets.....	2-2
2.1.3 Progress on Targets	2-3
2.1.4 SEAI Renewable Energy in Ireland 2020 Update.....	2-4
2.1.5 SEAI Energy in Ireland 2020 Report.....	2-5
2.1.6 Summary of Compliance with Renewable Energy Policy and Targets.....	2-6
2.2 National Policy	2-6

2.2.1	Introduction.....	2-6
2.2.2	National Renewable Energy Action Plan.....	2-6
2.2.3	White Paper on Energy Policy in Ireland 2015-2030.....	2-7
2.2.4	Renewable Electricity Support Scheme RESS.....	2-7
2.3	Climate Change Policy and Targets.....	2-8
2.3.1	Introduction.....	2-8
2.3.2	International Policy.....	2-9
2.3.3	Emissions Projections.....	2-10
2.3.4	National Policy.....	2-11
2.3.5	Summary of Compliance with Climate Change Policy.....	2-16
2.4	Strategic Planning Context.....	2-16
2.4.1	Introduction.....	2-16
2.4.2	Regional Policy.....	2-18
2.4.3	Local Policy.....	2-21
2.4.4	Other Relevant Guidelines.....	2-30
2.5	Planning History.....	2-33
2.5.1	Applications within the Site.....	2-33
2.5.2	Wind Energy Applications within 20km Site Radius.....	2-34
2.5.3	Applications within the Vicinity of the Wind Farm.....	2-35
2.6	Scoping and Consultations.....	2-35
2.6.1	Scoping.....	2-35
2.6.2	Scoping Responses.....	2-35
2.6.3	Planning Consultation and Process.....	2-39
2.7	Cumulative Impact Assessment.....	2-40
2.7.1	Methodology for the Cumulative Assessment of Projects.....	2-40
2.7.2	Projects Considered in Cumulative Assessment.....	2-40

3. CONSIDERATION OF REASONABLE ALTERNATIVES.....3-1

3.1	Introduction.....	3-1
3.1.2	Methodology.....	3-2
3.2	‘Do-Nothing’ Alternative.....	3-3
3.3	Alternative Locations.....	3-5
3.3.1	Site Selection Process.....	3-5
3.3.2	Review of Alternative Sites.....	3-6
3.3.3	Sustainability Strategy.....	3-6
3.4	Alternative Processes.....	3-6
3.5	Alternative Technologies.....	3-7
3.6	Alternative Turbine Layouts and Development Design – Repowering Option.....	3-9
3.6.1	Location of Ancillary Structures.....	3-11
3.7	Alternative Mitigation Measures.....	3-11

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT.....4-1

4.1	Introduction.....	4-1
4.2	Development Layout.....	4-2
4.3	Development Components.....	4-4
4.3.1	Wind Turbines.....	4-4
4.3.1.1	Turbine Locations.....	4-4
4.3.1.2	Turbine Type.....	4-5
4.3.1.3	Turbine Foundations.....	4-8
4.3.1.4	Hard Standing Areas.....	4-11
4.3.1.5	Power Output.....	4-11
4.3.2	Site Roads.....	4-11
4.3.3	Electricity Substation.....	4-14
4.3.3.1	Wind Farm Control Building.....	4-14
4.3.4	Site Cabling.....	4-17
4.3.5	Meteorological Mast.....	4-17
4.4	Access and Transportation.....	4-21

4.4.1	Site Entrance	4-21
4.5	Site Drainage	4-21
4.6	Construction	4-21
4.7	Operation	4-21
4.8	Decommissioning	4-22
5.	POPULATION AND HUMAN HEALTH	5-1
5.1	Introduction	5-1
5.1.1	Statement of Authority	5-1
5.2	Population	5-1
5.2.1	Receiving Environment	5-1
5.2.2	Population Trends	5-2
5.2.3	Population Density	5-5
5.2.4	Household Statistics	5-5
5.2.5	Age Structure	5-6
5.2.6	Employment and Economic Activity	5-6
5.2.6.1	Employment by Socio-Economic Group	5-6
5.2.6.2	Employment and Investment Potential in the Irish Wind Energy Industry	5-7
5.2.7	Land-Use	5-10
5.2.8	Services	5-11
5.2.8.1	Education	5-11
5.2.8.2	Access and Public Transport	5-11
5.2.8.3	Amenities and Community Facilities	5-11
5.3	Tourism	5-12
5.3.1	Tourism Numbers and Revenue	5-12
5.3.2	Tourist Attractions	5-13
5.3.3	Tourist Attitudes to Wind Farms	5-13
5.3.3.1	Scottish Tourism Survey 2016	5-13
5.3.3.2	Fáilte Ireland Surveys 2007 and 2012	5-14
5.4	Public Perception of Wind Energy	5-16
5.4.1	IWEA Interactions Opinion Poll on Wind Energy	5-16
5.4.2	Sustainable Energy Ireland Survey 2003	5-16
5.4.2.1	Background	5-16
5.4.2.2	Findings	5-16
5.4.2.3	Survey Update 2017	5-17
5.4.2.4	Conclusions	5-17
5.4.3	Public Perceptions of Wind Power in Scotland and Ireland Survey 2005	5-18
5.4.3.1	Background	5-18
5.4.3.2	Study Area	5-18
5.4.3.3	Findings	5-18
5.4.4	Public Perception Conclusions	5-19
5.5	Health Impacts of Wind Farms	5-19
5.5.1	Health Impact Studies	5-19
5.5.2	Turbine Safety	5-23
5.5.3	Electromagnetic Interference	5-24
5.5.4	Assessment of Effects on Human Health	5-24
5.5.5	Vulnerability of the Project to Natural Disasters and Major Accidents	5-25
5.6	Property Values	5-25
5.7	Shadow Flicker	5-28
5.7.1	Background	5-28
5.7.2	Guidance	5-30
5.7.3	Scoping	5-31
5.7.4	Shadow Flicker Prediction Methodology	5-31
5.7.5	Shadow Flicker Assessment Criteria	5-31
5.7.5.1	Turbine Dimensions	5-31
5.7.5.2	Study Area	5-32
5.7.5.3	Assumptions and Limitations	5-34
5.7.6	Shadow Flicker Assessment Results	5-35
5.7.6.1	Daily and Annual Shadow Flicker	5-35
5.7.6.2	Cumulative Shadow Flicker	5-37
5.8	Residential Amenity	5-37
5.9	Likely Significant Impacts and Associated Mitigation Measures	5-38
5.9.1	'Do-Nothing' Scenario	5-38

5.9.2	Construction Phase	5-38
5.9.2.1	Shadow Flicker	5-38
5.9.3	Operational Phase	5-39
5.9.3.1	Health and Safety.....	5-39
5.9.3.2	Employment and Investment.....	5-39
5.9.3.3	Population	5-40
5.9.3.4	Land-use	5-40
5.9.3.5	Property Values	5-40
5.9.3.6	Tourism and Amenity.....	5-40
5.9.3.7	Shadow Flicker	5-41
5.9.3.8	Residential Amenity.....	5-42
5.9.3.9	Noise	5-42
5.9.3.10	Traffic.....	5-43
5.9.4	Decommissioning Phase.....	5-43
5.9.5	Cumulative Effects.....	5-43
5.9.5.1	Health and Safety.....	5-43
5.9.5.2	Employment and Economic Activity	5-43
5.9.5.3	Tourism and Amenity.....	5-44
5.9.5.4	Property Values	5-44
5.9.5.5	Shadow Flicker	5-44
5.9.5.6	Residential Amenity.....	5-44

6. BIODIVERSITY6-1

6.1	Introduction.....	6-1
6.2	Objectives.....	6-1
6.3	Legislation and Ecological Guidance	6-1
6.4	Statement of Authority	6-2
6.5	Methodology and Limitations	6-2
6.5.1	Consultation.....	6-2
6.5.2	Desktop Review.....	6-2
6.5.3	Field surveys.....	6-3
6.5.4	Receptor Valuation	6-5
6.5.5	Methodology for Assessment of Effects	6-5
6.5.6	Limitations.....	6-7
6.6	Baseline Conditions and Receptor Valuation.....	6-7
6.6.1	Designated Sites	6-7
6.6.2	Habitats	6-11
6.6.3	Non-native Invasive Species.....	6-12
6.6.4	Bats	6-12
6.6.5	Other Mammals	6-13
6.6.6	Future baseline.....	6-14
6.7	Scoping	6-14
6.7.1	Potential impacts.....	6-14
6.7.2	Identification of Key Ecological Receptors	6-15
6.8	Assessment of effects	6-16
6.8.1	Do-Nothing Scenario.....	6-16
6.8.2	Operational Phase	6-16
6.9	Cumulative Effects	6-18
6.10	Summary	6-20

7. ORNITHOLOGY7-1

7.1	Introduction.....	7-1
7.2	Objectives.....	7-1
7.3	Legislation and Ecological Guidance	7-1
7.4	Statement of Authority	7-2
7.5	Methodology and Limitations	7-2
7.6	Desktop Review	7-2
7.7	Scoping and Consultation.....	7-2
7.8	Field surveys	7-2
7.9	Methodology for Assessment of Effects.....	7-3
7.9.1	Duration of Effect	7-3
7.9.2	Determining Sensitivity of Receptor	7-3

7.9.3	Determining the Magnitude of Change.....	7-3
7.9.4	Determining the Level of Effect.....	7-3
7.9.5	Determining the Significance of Effects.....	7-4
7.9.6	Limitations.....	7-5
7.10	Baseline Conditions and Receptor Valuation.....	7-5
7.10.1	Identification of Designated Sites within the Likely Zone of Influence of the Development.....	7-6
7.10.2	Historic Ornithology Baseline.....	7-7
7.10.2.1	Post-construction monitoring.....	7-8
7.10.3	Current Ornithology Baseline.....	7-9
7.10.3.1	Summer (breeding) Season.....	7-9
7.10.3.2	Winter (non-breeding) Season.....	7-12
7.10.4	Future baseline.....	7-14
7.11	Scoping.....	7-14
7.11.1	Construction Phase.....	7-14
7.11.2	Operational Phase.....	7-14
7.11.3	Decommissioning Phase.....	7-14
7.11.4	Identification of Key Ecological Receptors.....	7-15
7.12	Assessment of Effects.....	7-16
7.12.1	Environmental Design Measures.....	7-16
7.12.2	Likely and Significant Impacts.....	7-16
7.12.3	Do-Nothing Scenario.....	7-16
7.12.4	Operational Phase.....	7-16
7.12.4.1	Impacts on Designated Sites.....	7-17
7.12.4.2	Birds (not forming SCIs of SPAs) flying over windfarm airspace.....	7-18
7.12.4.3	Breeding and wintering birds using habitat in immediate vicinity of windfarm.....	7-19
7.12.5	Monitoring and Mitigation.....	7-20
7.12.6	Decommissioning Phase.....	7-20
7.13	Cumulative Effects.....	7-20
7.14	Summary.....	7-22

8. LAND, SOILS AND GEOLOGY8-1

8.1	Introduction.....	8-1
8.1.1	Background & Objectives.....	8-1
8.1.2	Statement of Authority.....	8-1
8.1.3	Relevant Legislation.....	8-2
8.1.4	Relevant Guidance.....	8-2
8.2	Methodology.....	8-3
8.2.1	Desk Study.....	8-3
8.2.2	Walkover Survey.....	8-3
8.2.3	Scoping and Consultation.....	8-3
8.2.4	Impact Assessment Methodology.....	8-4
8.2.5	Limitations/Difficulties Encountered.....	8-5
8.3	Receiving Environment.....	8-7
8.3.1	Pre-existing Environment.....	8-7
8.3.1.1	Site Description and Topography.....	8-7
8.3.1.2	Soils and Subsoils.....	8-7
8.3.1.3	Bedrock Geology.....	8-8
8.3.1.4	Geological Heritage and Designated Sites.....	8-13
8.3.1.5	Soil Contamination.....	8-13
8.3.1.6	Economic Geology.....	8-13
8.4	Characteristics of the Development.....	8-13
8.5	Likely, Significant Impacts and Mitigation Measures Implemented.....	8-14
8.5.1	Do-Nothing Scenario.....	8-14
8.5.2	Construction Phase Impacts.....	8-14
8.5.3	Operational Phase Impacts.....	8-14
8.5.3.1	Contamination of Soil by Leakages and Spillages.....	8-14
8.5.4	Decommissioning Phase.....	8-15
8.5.5	Potential Cumulative Impacts.....	8-16
8.5.6	Summary.....	8-16

9.	WATER.....	9-1
9.1	Introduction.....	9-1
9.1.1	Background and Objectives	9-1
9.1.2	Statement of Authority.....	9-1
9.1.3	Scoping and Consultation.....	9-2
9.1.4	Relevant Legislation.....	9-2
9.1.5	Relevant Guidance	9-3
9.2	Methodology.....	9-4
9.2.1	Desk Study & Preliminary Hydrological Assessment	9-4
9.2.2	Site Investigations.....	9-4
9.2.3	Impact Assessment Methodology.....	9-5
9.3	Receiving Environment.....	9-5
9.3.1	Site Description, Land and Topography.....	9-5
9.3.2	Water Balance	9-6
9.3.3	Surface Water.....	9-7
9.3.3.1	Regional and Local Hydrology	9-7
9.3.3.2	Local and Site Drainage.....	9-7
9.3.3.3	Flood Risk Identification	9-8
9.3.3.4	Surface Water Hydrochemistry.....	9-12
9.3.4	Groundwater.....	9-12
9.3.4.1	Hydrogeology.....	9-12
9.3.4.2	Groundwater Vulnerability.....	9-15
9.3.4.3	Groundwater Hydrochemistry.....	9-15
9.3.5	Water Framework Directive Water Body Status & Objectives	9-15
9.3.5.1	Groundwater Body Status.....	9-15
9.3.5.2	Surface Water Body Status.....	9-15
9.3.6	Designated Sites & Habitats	9-15
9.3.7	Water Resources	9-16
9.3.8	Receptor Sensitivity	9-17
9.4	Likely, Significant Impacts and Mitigation Measures Implemented	9-17
9.4.1	Overview of Impact Assessment Process.....	9-17
9.4.2	Do-Nothing Scenario.....	9-19
9.4.3	Construction Phase	9-19
9.4.4	Operational Phase	9-19
9.4.4.1	Potential Release of Hydrocarbons During Operation and Storage.....	9-20
9.4.5	Decommissioning Phase - Likely Significant Effects and Mitigation Measures.....	9-21
9.4.5.1	Earthworks Resulting in Suspended Solids Entrainment in Surface Waters	9-22
9.4.5.2	Potential Impacts on Groundwater Levels and Local Well Supplies During Excavations.....	9-23
9.4.5.3	Potential Release of Hydrocarbons during Construction and Storage	9-23
9.4.5.4	Potential Hydrological Impacts on Designated Sites.....	9-24
9.4.6	Cumulative Impacts.....	9-25
10.	AIR AND CLIMATE.....	10-1
10.1	Introduction.....	10-1
10.2	Air Quality.....	10-1
10.2.1	Air Quality Standards.....	10-1
10.2.2	Air Quality Zones.....	10-4
10.2.3	Existing Air Quality.....	10-5
10.2.4	Likely, Significant Impacts on Air Quality and Associated Mitigation Measures	10-8
10.3	Climate.....	10-10
10.3.1	Climate	10-10
10.3.2	Climate Change and Greenhouse Gases.....	10-10
10.3.3	Programme for Government	10-17
10.3.4	Climate and Weather in the Existing Environment.....	10-18
10.3.5	Calculating Savings from the Proposed Development.....	10-21
10.3.6	Likely, Significant Impacts on Climate and Associated Mitigation Measures.....	10-22
10.4	Cumulative Impact Assessment	10-23

11.	NOISE & VIBRATION	11-1
11.1	Introduction	11-1
11.1.1	Statement of Authority	11-1
11.1.2	Fundamentals of Acoustics	11-1
11.2	Guidance, Legislation and Assessment Criteria	11-3
11.2.1	Pre-Application Consultations	11-3
11.2.2	Decommissioning Phase	11-4
11.2.2.1	Decommissioning Noise Criteria	11-4
11.2.2.2	Decommissioning Vibration	11-5
11.2.3	Operational Noise	11-7
11.2.3.1	Assessment Methodology	11-8
11.2.3.2	Wind Energy Development Guidelines (WEDG06)	11-9
11.2.3.3	Special Audible Characteristics	11-9
11.2.3.4	Substation Noise Limits	11-13
11.2.4	Attended Monitoring	11-14
11.3	Methodology	11-14
11.4	Study Area	11-14
11.4.1	Screening Area	11-14
11.4.2	Noise Prediction Methodology	11-14
11.4.3	Proposed Turbine Model	11-15
11.4.3.1	Vestas V52-850 kW	11-16
11.4.3.2	Model Over-Prediction with Vestas Data Sheet Sound Power Levels	11-16
11.4.4	Carnsore Turbine Coordinates	11-17
11.4.5	Existing Operational WTN	11-18
11.4.5.1	Unattended Operational Monitoring	11-18
11.4.5.2	Attended Monitoring	11-20
11.4.5.3	Objective Assessment of Special Audible Characteristics	11-21
11.4.6	Calibration of Noise Model with Measurements	11-22
11.4.7	Cumulative Assessment	11-22
11.4.8	Predicted Noise Contours	11-22
11.5	Receiving Environment	11-22
11.5.1	Noise Monitoring Locations	11-22
11.5.2	Noise Monitoring Equipment	11-23
11.5.3	Wind Data	11-23
11.5.4	Baseline Monitoring Results	11-24
11.5.4.1	Night-time Baseline Levels	11-24
11.5.4.2	Daytime Amenity Noise Levels	11-26
11.5.5	WEDG06 Noise Limits	11-28
11.5.5.1	Night-time Limits	11-28
11.5.5.2	Daytime Limits	11-29
11.5.6	Sensitivity of Receptors	11-29
11.6	Impacts of Proposed Development	11-30
11.6.1	Do Nothing Effects	11-30
11.6.2	Construction & Decommissioning Phases	11-30
11.6.2.1	Decommissioning Noise	11-30
11.6.2.2	Decommissioning Vibration	11-31
11.6.2.3	Site Traffic Noise and Vibration	11-32
11.6.3	Operational Phase Noise	11-32
11.6.3.1	Intensity of Special Audible Characteristics	11-35
11.6.4	Operational Phase Vibration	11-35
11.6.5	Substation Operational Noise	11-35
11.6.6	Uncertainty of Prediction Methods	11-36
11.7	Mitigation Measures	11-37
11.7.1	Decommissioning Phase	11-37
11.7.1.1	Decommissioning Noise and Vibration	11-37
11.7.1.2	Site Traffic Noise and Vibration	11-37
11.7.2	Operational Phase	11-38
11.7.2.1	Turbine Noise Emissions	11-38
11.7.2.2	Substation Noise Emissions	11-40
11.8	Residual Impacts	11-40
11.8.1	Operational Phase Noise	11-40
11.8.2	Operational Phase Vibration	11-40
11.8.3	Decommissioning Phases	11-40

11.8.3.1	Decommissioning Noise.....	11-40
11.8.3.2	Construction & Decommissioning Vibration.....	11-41
11.8.3.3	Site Traffic Noise and Vibration.....	11-41
11.8.4	Substation Noise Levels.....	11-41
11.9	Cumulative Effects	11-42

12. ARCHAEOLOGY AND CULTURAL HERITAGE.....12-1

12.1	Introduction.....	12-1
12.1.1	Proposed Development.....	12-1
12.1.2	Statement of Authority.....	12-1
12.1.3	Legislation and Guidelines	12-1
12.1.3.1	Current Legislation.....	12-1
12.1.4	Wexford County Development Plan 2013-2019.....	12-3
12.1.4.1	Archaeology.....	12-3
12.1.4.2	Built Heritage.....	12-4
12.1.4.3	Statutory Consultations.....	12-4
12.1.5	Location and Topography.....	12-5
12.2	Assessment Methodology	12-7
12.2.1	Geographical Information Systems.....	12-7
12.2.2	Desktop Assessment.....	12-7
12.2.2.1	Record of Monuments and Places, Sites and Monuments Record and National Monuments	12-7
12.2.2.2	Cartographic Sources and Aerial Photography	12-8
12.2.2.3	Topographical Files - National Museum of Ireland	12-8
12.2.2.4	Archaeological Inventory Series.....	12-8
12.2.2.5	Record of Protected Structures	12-8
12.2.2.6	Excavations Database.....	12-8
12.2.2.7	National Inventory of Architectural Heritage	12-8
12.2.3	Field Inspection.....	12-9
12.2.3.1	Limitations Associated with Fieldwork.....	12-9
12.2.4	Assessment of Likely Significant Effects	12-9
12.2.4.1	Types of Impact	12-9
12.2.5	Methodology for the assessment of impacts on visual setting (indirect effects).....	12-10
12.3	Existing Environment	12-11
12.3.1	Archaeological Heritage.....	12-11
12.3.1.1	National Monuments (State Care and those with Preservation Orders).....	12-11
12.3.1.2	Recorded Monuments within the EIA R site boundary	12-14
12.3.1.3	Recorded Monuments within 2km of Turbines.....	12-19
12.3.1.4	Lady's Island Pilgrimage Site.....	12-25
12.3.1.5	Archaeological Investigations undertaken within the Proposed Development site and adjacent to same	12-26
12.3.1.6	Topographical Museum Files	12-26
12.3.1.7	Cartographic Evidence.....	12-26
12.3.1.8	Description of the Proposed Development Area	12-32
12.3.2	Architectural and Cultural Heritage	12-32
12.3.2.1	Protected Structures and NIAH within the Proposed Development site boundary.....	12-32
12.3.2.2	Protected Structures and NIAH within 2km of the nearest turbines.....	12-32
12.3.3	Cultural Heritage	12-40
12.4	Likely Significant Effects and Associated Mitigation Measures	12-40
12.4.1	Do-Nothing Scenario.....	12-40
12.4.2	Construction Phase Potential Impacts – Indirect.....	12-40
12.4.3	Construction Phase Potential Impacts (Direct)	12-40
12.4.4	Operational Phase Potential Impacts (Direct)	12-41
12.4.5	Operational Phase Potential Impacts (Indirect).....	12-41
12.5	Cumulative Impacts	12-41
12.5.1	Cumulative Impacts (Direct Impacts – Construction stage).....	12-41
12.5.2	Cumulative Impacts (Indirect)	12-42
12.6	Decommissioning Phase.....	12-42
12.7	Conclusion.....	12-42
12.8	References	12-44

13.	LANDSCAPE AND VISUAL	13-1
13.1	Introduction.....	13-1
13.2	Statement of Authority	13-2
13.2.1	Proposed Development Description.....	13-2
13.2.2	Mitigation by Good Design	13-2
13.2.3	Assessments of other alternative turbine designs	13-3
13.2.4	Scoping Replies.....	13-3
13.3	Brief Methodology and Assessment Criteria	13-3
13.3.1	Scope and Definition of Landscape and Visual Impact Assessment (LVIA) Study Area	13-3
13.3.2	Guidelines.....	13-4
13.3.3	Baseline Landscape and Visual Information	13-4
13.3.4	Assessment of Potential Impacts	13-4
13.4	Visibility of the Carnsore Wind Farm Development.....	13-5
13.4.1	ZTV Mapping: Theoretical Visibility of the Proposed Development.....	13-5
13.4.2	Landscape and Site Context.....	13-9
13.5	Landscape Baseline	13-12
13.5.1	Landscape Designations	13-12
13.5.2	Landscape Character of the Proposed Development.....	13-24
13.5.3	Landscape Character of the LVIA Study Area.....	13-31
13.6	Cumulative Baseline.....	13-31
13.7	Representative Viewpoints and Photomontage Locations	13-32
13.8	Likely or Significant Landscape and Visual Effects.....	13-35
13.8.1	'Do-Nothing' Alternative	13-35
13.8.2	Construction Phase Effects	13-35
13.8.3	Operational Phase Effects	13-35
13.8.4	Decommissioning Phase.....	13-44
13.9	Conclusion.....	13-44
14.	MATERIAL ASSETS	14-1
14.1	Introduction.....	14-1
14.1.1	Statement of Authority	14-1
14.1.2	Guidance and Legislation	14-1
14.1.3	Scoping and Consultation.....	14-1
14.2	Traffic and Transport.....	14-2
14.2.1	Receiving Environment	14-2
14.2.2	Likely and Significant Effects and Associated Mitigation Measures	14-4
14.3	Telecommunications and Aviation	14-6
14.3.1	Introduction.....	14-6
14.3.2	Background	14-6
14.3.3	Likely Significant Effects and Associated Mitigation Measures.....	14-7
15.	INTERACTION OF EFFECTS	15-1
15.1	Introduction.....	15-1
15.1.1	Statement of Authority.....	15-3
15.2	Impact Interactions	15-3
15.2.1	Population and Human Health.....	15-3
15.2.2	Biodiversity	15-4
15.2.3	Ornithology.....	15-6
15.2.4	Land, Soils and Geology.....	15-7
15.2.5	Air and Climate.....	15-7
15.2.6	Landscape and Visual	15-8
15.3	Mitigation and Residual Impacts	15-8
16.	SCHEDULE OF MITIGATION	16-1

16.1	Introduction.....	16-1
16.2	EIAR Mitigation Measures	16-2

TABLE OF TABLES

<i>Table 1-1 Townlands within which the Proposed Development is located.....</i>	<i>1-2</i>
<i>Table 1-2 Impact Classification Terminology (EPA, 2017).....</i>	<i>1-16</i>
<i>Table 1-3 Project Team.....</i>	<i>1-18</i>
<i>Table 2-1: Applications within the Application Site</i>	<i>2-34</i>
<i>Table 2-2 Wind Energy Applications within 20km of the Development Site.....</i>	<i>2-34</i>
<i>Table 2-3 Scoping Responses.....</i>	<i>2-36</i>
<i>Table 3-1 Comparison of environmental effects when compared against the chosen option (maintaining the existing wind farm at this site).....</i>	<i>3-4</i>
<i>Table 3-2 Comparison of environmental effects when compared against the chosen option (maintaining use of wind turbines).....</i>	<i>3-8</i>
<i>Table 3-3 Comparison of environmental effects when compared against the chosen option (smaller wind turbines).....</i>	<i>3-10</i>
<i>Table 4-1 Proposed Development components footprint.....</i>	<i>4-4</i>
<i>Table 4-2 Existing Wind Turbine Locations and Elevations.....</i>	<i>4-4</i>
<i>Table 5-1 Population 2011 – 2016 (Source: CSO).....</i>	<i>5-2</i>
<i>Table 5-2 Population Density in 2016 (Source: CSO).....</i>	<i>5-5</i>
<i>Table 5-3 Number of Household and Average Household Size 2011 – 2016 (Source: CSO).....</i>	<i>5-5</i>
<i>Table 5-4 Population per Age Category in 2016 (Source: CSO).....</i>	<i>5-6</i>
<i>Table 5-5 Farm Size and Classification within the Study Area in 2010 (Source: CSO).....</i>	<i>5-10</i>
<i>Table 5-6 Overseas Tourists Revenue and Numbers 2019.....</i>	<i>5-12</i>
<i>Table 5-7 Maximum Potential Daily & Annual Shadow Flicker – Carnsore Wind Farm, Co. Wexford.....</i>	<i>5-36</i>
<i>Table 6-1 Summary of bat activity surveys.....</i>	<i>6-3</i>
<i>Table 6-2 Summary and comparison between CIEEM and EPA guidelines for determining significance of ecological effects.....</i>	<i>6-6</i>
<i>Table 6-3 Qualifying Interests and Special Conservation Interests of SACs within 15km of the Proposed Development.....</i>	<i>6-8</i>
<i>Table 6-4 Ecological valuation of habitats present within Carnsore Wind Farm.....</i>	<i>6-12</i>
<i>Table 6-5 Identification of KERs.....</i>	<i>6-15</i>
<i>Table 6-6 Development proposals included in the in combination assessment.....</i>	<i>6-18</i>
<i>Table 6-7 Review of plans and policies.....</i>	<i>6-18</i>
<i>Table 7-1 Summary and comparison between CIEEM and EPA guidelines for determining significance of ecological effects.....</i>	<i>7-4</i>
<i>Table 7-2 Designated sites within 15km of Carnsore windfarm.....</i>	<i>7-6</i>
<i>Table 7-3 Monthly peak counts of target species recorded (those in Bold reflect SCIs of adjacent lady island and Tacumshin Lake SPAs) during 2020 surveys.....</i>	<i>7-10</i>

Table 7-4 Monthly peak counts of secondary species recorded.....	7-11
Table 7-5 Monthly peak counts of species recorded during winter walkover surveys November 2019 to March 2020 (those in Bold interest features of adjacent lady island and Tacumshin Lake SPAs).....	7-12
Table 7-6 Monthly peak counts of target species recorded during winter VP surveys November 2019 to March 2020.....	7-13
Table 7-7 Monthly peak counts of secondary species recorded during winter VP surveys November 2019 to March 2020 (those in Bold reflect SCIs of adjacent lady island and Tacumshin Lake SPAs)	7-13
Table 7-8 Development proposals included in the in-combination assessment.....	7-20
Table 7-9 Development proposals included in the in-combination assessment.....	7-21
Table 8-1. Estimation of Importance of Soil and Geology Criteria (NRA, 2008).....	8-4
Table 8-2. Additional Impact Characteristics.	8-6
Table 8-3 Impact descriptors related to the receiving environment.....	8-6
Table 9-1 Summary of Water Environment related Scoping Responses.....	9-2
Table 9-2: Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk).....	9-5
Table 9-3: Local Average long-term Rainfall Data (mm).....	9-6
Table 9-5: Impact Assessment Steps.....	9-18
Table 10-1 Limit values of Directive 2008/50/EC, 1999/30/EC and 2000/69/EC (Source: EPA).....	10-2
Table 10-2 Target values for Ozone Defined in Directive 2008/50/EC.....	10-4
Table 10-3 Sulphur Dioxide Data for Wexford 2005-2006.....	10-5
Table 10-4 Particulate Matter (PM ₁₀) Data for Wexford 2006-2007.....	10-6
Table 10-5 Nitrogen Dioxide and Oxides of Nitrogen Data for Wexford 2006-2007.....	10-6
Table 10-6 Carbon Monoxide Data for Wexford 2005-2006.....	10-7
Table 10-7 Ozone Data for Carnsore Point 2019.....	10-7
Table 10-8 United Nations Sustainable Development Goals adopted in 2015. https://sustainabledevelopment.un.org/sdgs	10-12
Table 10-9 Data from Met Éireann Weather Station, Rosslare, Co. Wexford 1978 to 2007.....	10-19
Table 11-1 Subjective effect of changes to noise levels.....	11-2
Table 11-2 Consultation Responses.	11-4
Table 11-3 Decommissioning Noise limits.....	11-5
Table 11-4 Guidance of effects of Vibration Levels on residents.....	11-6
Table 11-5 Transient vibration guide for cosmetic damage.....	11-7
Table 11-6 Summary of operational noise requirements for the Proposed Development.....	11-9
Table 11-7 DRWEDG2019 Wind Turbine low frequency noise limits.....	11-12
Table 11-8 RPS external LFN assessment spectrum.....	11-12
Table 11-9 Subjective rating of Special Audible Characteristics at monitoring sites.....	11-14
Table 11-10 Atmospheric attenuation values used in the model.....	11-15
Table 11-11 Vestas V52-850 kW turbine sound power levels for standardised 10m wind speed.....	11-16
Table 11-12 Assumed Vestas V52-850 kW turbine sound power level spectrum for standardised 10m wind speed.....	11-16

<i>Table 11-13 Proposed Carnsore Wind Farm turbine locations, Irish Transverse Mercator</i>	11-17
<i>Table 11-14 Scatterplot trendline values at integer wind speeds</i>	11-20
<i>Table 11-15 Attended site observations</i>	11-20
<i>Table 11-16 Baseline/Operational noise monitoring locations</i>	11-23
<i>Table 11-17 Noise monitoring equipment used during surveys</i>	11-23
<i>Table 11-18 Measured night-time background noise levels and WEDG06 noise limits in dB(A) L₉₀ at noise sensitive locations</i>	11-29
<i>Table 11-19 Measured daytime amenity background noise levels and WEDG06 noise limits in dB(A) L₉₀ at noise sensitive locations</i>	11-29
<i>Table 11-20 Assessed Sensitivity of Receptors</i>	11-30
<i>Table 11-21 - EPA description of effects: Decommissioning Noise</i>	11-31
<i>Table 11-22 - EPA description of effects: Decommissioning Vibration</i>	11-32
<i>Table 11-23 - EPA description of effects: Site Traffic Noise and Vibration</i>	11-32
<i>Table 11-24 Predicted/measured WTN levels at 30 nearest NSLs</i>	11-33
<i>Table 11-25 - EPA description of effects: Operational phase Proposed Development noise for NSL001</i>	11-34
<i>Table 11-26 - EPA description of effects: Operational phase Proposed Development noise for all other receivers</i>	11-34
<i>Table 11-27 - EPA description of effects: Operational phase proposed turbine noise – Intensity of Special Audible Characteristics</i>	11-35
<i>Table 11-28 - EPA description of effects: Operational phase turbine vibration</i>	11-35
<i>Table 11-29 – Substation noise</i>	11-35
<i>Table 11-30 - EPA description of effects: Operation phase substation noise</i>	11-36
<i>Table 11-31 Manufacturer specified noise reduction in dBA for Vestas V52 at Standardised 10m wind speed (V10) in m/s for different operating modes relative to ‘Level 0’ operating mode</i>	11-39
<i>Table 11-32 Mitigation strategy and required attenuation of turbine noise to achieve compliance under downwind conditions</i>	11-39
<i>Table 11-33 - EPA description of effects: Operational phase proposed turbine noise</i>	11-40
<i>Table 11-34 - EPA description of effects: Operational phase turbine vibration</i>	11-40
<i>Table 11-35 - EPA description of effects: Decommissioning Noise</i>	11-41
<i>Table 11-36 - EPA description of effects: Decommissioning Vibration</i>	11-41
<i>Table 11-37 - EPA description of effects: Site Traffic Noise and Vibration</i>	11-41
<i>Table 11-38 - EPA description of effects: Operation phase substation noise</i>	11-41
<i>Table 12-1: Cultural Heritage Assets considered according to sensitivity in the baseline environment</i>	12-10
<i>Table 12-2: National Monuments and those subject to Preservation Orders within 10km of nearest proposed turbine</i>	12-11
<i>Table 12-3: SMR within the Site boundary</i>	12-14
<i>Table 12-4: RMPs within 5km of the nearest proposed turbines</i>	12-19
<i>Table 12-5: RPS structures within 5km of the nearest proposed turbines</i>	12-32

<i>Table 13-1 Summary of Landscape Effects of Landscape Character Types.....</i>	<i>13-36</i>
<i>Table 13-2 Viewpoint Assessment Summary.....</i>	<i>13-38</i>
<i>Table 13-3 Summary of Viewpoint Impact Assessment Results.....</i>	<i>13-40</i>
<i>Table 15-1 Interaction Matrix: Potential for Interacting Impacts.....</i>	<i>15-2</i>
<i>Table 16-1 Schedule of Mitigation, Carnsore Wind Farm.....</i>	<i>16-3</i>

TABLE OF FIGURES

<i>Figure 1-1 Site Location Map</i>	1-3
<i>Figure 4-1 Existing Development Layout</i>	4-3
<i>Figure 4-2 Wind Turbine Elevation and Plan</i>	4-7
<i>Figure 4-3 Turbine nacelle and hub components</i>	4-8
<i>Figure 4-4 Typical Turbine Base Layout</i>	4-9
<i>Figure 4-5 Turbine Foundation Design</i>	4-10
<i>Figure 4-6 Typical Wind Farm Site Access Road Detail</i>	4-13
<i>Figure 4-7 Site Substation Layout</i>	4-15
<i>Figure 4-8 Control Building Detail</i>	4-16
<i>Figure 4-9 Typical Cable Trench Cross-section Detail</i>	4-17
<i>Figure 4-10 Met mast cabin elevations</i>	4-19
<i>Figure 4-11 Met mast plan and elevation</i>	4-20
<i>Figure 5-1 Population Study Area</i>	5-4
<i>Figure 5-2 Population Distribution by Age Category in 2016</i>	5-6
<i>Figure 5-3 Employment by socio-economic group in 2016</i>	5-7
<i>Figure 5-4 Shadow-Prone Area as Function of Time of Day (Source: Helimax Energy, 2008)</i>	5-29
<i>Figure 5-5 Turbine Blade Position and Shadow Flicker Impact (Source: Wind Fact Sheet: Shadow Flicker, Noise Environment Power LLC)</i>	5-29
<i>Figure 5-6 Shadow Flicker Study Area</i>	5-33
<i>Figure 6-1 Special Areas of Conservation in the vicinity of the Proposed Development</i>	6-10
<i>Figure 6-2 The proposed site boundary in relation to Lady’s Island Lake SAC and Carnsore Point SAC</i>	6-11
<i>Figure 7-1 European designated sites with avian interest within 15km of Carnsore windfarm</i>	7-6
<i>Figure 8-1 Site Topography</i>	8-9
<i>Figure 8-2 Local Subsoils Map</i>	8-10
<i>Figure 8-3 Bedrock Geology Map</i>	8-11
<i>Figure 8-4 Geological Heritage Sites</i>	8-12
<i>Figure 9-1 Regional Hydrology Map</i>	9-9
<i>Figure 9-2 Local Hydrology Map</i>	9-10
<i>Figure 9-3 Site Drainage Features</i>	9-11
<i>Figure 9-4 Bedrock Aquifer Map</i>	9-13
<i>Figure 9-5 Regional Groundwater Body Map</i>	9-14
<i>Figure 11-1 Typical sound pressure levels on the dB(A) scale</i>	11-3
<i>Figure 11-2 Table E.1 from BS 5228 detailing ABC method</i>	11-5
<i>Figure 11-3 Night-time operational noise at Site 4 under downwind conditions, exclusions have been made with reference to M5 Weather Buoy wave data</i>	11-19

<i>Figure 11-4 Night-time baseline noise at Site 4 under downwind conditions, exclusions have been made with reference to M5 Weather Buoy wave data.....</i>	<i>11-19</i>
<i>Figure 11-5 Background noise monitoring results at Site 1.....</i>	<i>11-24</i>
<i>Figure 11-6 Background noise monitoring results at Site 2.....</i>	<i>11-25</i>
<i>Figure 11-7 Background noise monitoring results at Site 3.....</i>	<i>11-25</i>
<i>Figure 11-8 Background noise monitoring results at Site 4.....</i>	<i>11-26</i>
<i>Figure 11-9 Background noise monitoring results at Site 1.....</i>	<i>11-27</i>
<i>Figure 11-10 Background noise monitoring results at Site 2.....</i>	<i>11-27</i>
<i>Figure 11-11 Background noise monitoring results at Site 3.....</i>	<i>11-28</i>
<i>Figure 11-12 Background noise monitoring results at Site 4.....</i>	<i>11-28</i>
<i>Figure 12-1: Site Location Map.....</i>	<i>12-6</i>
<i>Figure 12-2: National Monuments within 10km of the nearest existing turbine</i>	<i>12-12</i>
<i>Figure 12-3: SMRs within site boundary.....</i>	<i>12-15</i>
<i>Figure 12-4: RMPs within 2km of the nearest turbine</i>	<i>12-22</i>
<i>Figure 12-5: Down Survey map (Down Survey Maps / The Down Survey Project (tcd.ie)).....</i>	<i>12-27</i>
<i>Figure 12-6: Down Survey Parish map of Carn showing vacant space where the wind farm site is located. Note windmill and castle in Castletown townland to the west (upper side of map).....</i>	<i>12-28</i>
<i>Figure 12-7: Existing turbines and substation overlaid on 1st edition OS background.</i>	<i>12-29</i>
<i>Figure 12-8: Proposed Development shown on 1st edition OS map.....</i>	<i>12-30</i>
<i>Figure 12-9: Detail of St Vogue’s and Giants Grave to the south of T3 (Wedge tomb now gone).....</i>	<i>12-31</i>
<i>Figure 12-10: Record of Protected structures and NIAH within 2km of the nearest turbine.</i>	<i>12-39</i>
<i>Figure 13-1 Half Blade ZTV Map of the Carnsore Wind Farm development and LVIA Study Area</i>	<i>13-7</i>
<i>Figure 13-2 Topography of the site and study area.....</i>	<i>13-8</i>
<i>Figure 13-3 Landscape Designations within the LVIA Study Area.....</i>	<i>13-13</i>
<i>Figure 13-4 Landscape Designations within the LVIA Study Area and ZTV mapping.....</i>	<i>13-14</i>
<i>Figure 13-5 County Wexford walking and cycle trails map.....</i>	<i>13-19</i>
<i>Figure 13-6 County Wexford Wind Energy Strategy Map (WCDP 2013-2019).....</i>	<i>13-21</i>
<i>Figure 13-7 Visual Baseline</i>	<i>13-22</i>
<i>Figure 13-8 Visual Baseline and Half Blade ZTV.....</i>	<i>13-23</i>
<i>Figure 13-9 Locations of Photomontage Viewpoints.....</i>	<i>13-34</i>
<i>Figure 14-1 Site Access.....</i>	<i>14-3</i>

TABLE OF PLATES

<i>Plate 2-1 Installed Wind Generation Capacity 2000 - 2019 (SEAI, 2020)</i>	2-4
<i>Plate 2-2 Renewable Electricity Share in 2018 by EU Member States (SEAI, 2020)</i>	2-4
<i>Plate 2-3 Ireland's Decarbonisation Pathway Dashboard to 2030 (DCCAE, 2019)</i>	2-14
<i>Plate 2-4 Potential Metrics to Deliver Abatement in Electricity (DCCAE, 2019)</i>	2-15
<i>Plate 2-5 Wexford Wind Energy Strategy Map (WCC, 2013)</i>	2-23
<i>Plate 2.7 Draft Wexford Wind Energy Strategy 2021-2027 (General Site Location Indicated with Star)</i>	2-27
<i>Plate 4-1 Wind turbine components</i>	4-5
<i>Plate 4-2 Typical existing site road</i>	4-12
<i>Plate 4-3 Existing meteorological mast and air monitoring mast</i>	4-18
<i>Plate 5-1 View of Proposed Development from Carnsore Point Coastal Walking Trail</i>	5-12
<i>Plate 8-1 Site topography and rock outcropping</i>	8-8
<i>Plate 9-1 Typical drainage channel on site</i>	9-8
<i>Plate 12-1: Tacumshane Windmill from the east (Photo courtesy of the National Monuments Service)</i>	12-13
<i>Plate 13-1 View of Carnsore Wind Farm from Carnsore Point Walking Trail</i>	13-9
<i>Plate 13-2 View towards Carnsore Wind Farm from Carne Beach</i>	13-10
<i>Plate 13-3 View towards Carnsore Wind Farm from the L3061 adjacent to Carne Beach</i>	13-10
<i>Plate 13-4 View towards Carnsore Wind Farm from the N25 at Rosslare Harbour</i>	13-11
<i>Plate 13-5 View towards Carnsore Wind Farm from Lady's Island</i>	13-11
<i>Plate 13-6 View of grass fields outlined by scrub vegetation with coastal panoramic views</i>	13-27
<i>Plate 13-7 Landcover comprising grass fields outlined by low vegetation</i>	13-27
<i>Plate 13-8 Landcover consisting of grass fields, low vegetation and rock outcrops</i>	13-28
<i>Plate 13-9 View of the site showing agricultural lands on western boundary</i>	13-29
<i>Plate 13-10 View of Carnsore Point Coastal Trail adjacent to eastern site boundary</i>	13-29
<i>Plate 13-11 View of the overhead line northwest of the site along the L3061</i>	13-32