Derrybrien Wind Farm Project

Gort Windfarms Ltd.

Remedial Environmental Impact Assessment Report
Chapter 16 - Major Accidents and Disasters

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16.1 Introduction

16.1.1 Chapter Scope

This chapter assesses the potential for significant adverse effects arising from the Derrybrien Wind Farm Project on the environment with respect to major accidents and disasters for the

- Derrybrien Wind Farm and associated ancillary works;
- Grid connection comprising Derrybrien-Agannygal 110 kV Overhead Line and Agannygal Substation connecting into the Shannonbridge -Ennis 110 kV Overhead Line and associated ancillary works; and
- Works undertaken in response to the peat slide and associated ancillary works

The requirement to address major accidents and disasters in Environmental Impact Assessment (EIA) was introduced in the 2014 EIA Directive.[1]

The information relevant to major accidents and/or disasters to be included in an Environmental Impact Assessment Report (EIAR) is set out in Points 5(d) and 8 of Annex IV of the EIA Directive as follows:

"5. A description of the likely significant effects of the proposed project on the environment resulting from, inter alia: …

(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);…."

"(8) A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies".

The assessment of major accidents and disasters covers both natural (e.g. earthquakes) and man-made disasters (e.g. technological hazards) that could

[1] Directive 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014

significantly impact the Project's activities and objectives, and which might have adverse effects.

The assessment of Major Accidents is a new requirement of the EIA Directive. For context, development consents for the project were granted in phases - in the form of a number of planning permissions obtained between 1998 and 2002 as follows:

- Wind farm Phase 1 – Permission granted 12th October 1998
- Wind farm Phase 2 – Permission granted 12th October 1998
- Wind farm Phase 3 – Permission granted 15th November 2001
- Grid Connection - Permission granted 10th August 1999

It should be noted that an assessment of major accidents was not required at the time the permission was granted. Project mobilisation works for Derrybrien Wind Farm began in mid-2003, with an initial phase comprising forestry felling, site road construction, temporary compound construction, upgrading of the access road and the construction of c.50% of the turbine bases. All phases of the project (as defined by the separate planning consents) were constructed in parallel.

In October 2003, during the construction of the wind farm, a large peat slide occurred. The slide originated within the wind farm site boundary to the south of the site. In the aftermath of the peat slide, engineering measures were implemented. These comprised containment and stabilisation works to minimise effects on lands, receiving watercourses and the local road network. During this period – October 2003 to June 2004, construction works on the wind farm itself were suspended.

From June 2004 to March 2006, the construction of the wind farm and the grid connection (comprising both the overhead line and Agannygal substation) were completed.

Derrybrien Wind Farm was commissioned between September 2005 and March 2006 and commenced commercial operations in March 2006.

The wind farm has been in continuous operation since that time. It is envisaged that the wind farm will operate until c. 2040. At that time the wind farm and associated development will be decommissioned.

For completeness the assessment of major accidents has included the construction phases 2003 and 2003 to 2006, the peat slide which occurred in 2003, the operational phase from 2006 to circa 2040 and the decommissioning phase.

16.1.2 Statement of Authority

The chapter was prepared by Roisin O'Donovan B.E. (Civil), C. Eng., MIEI; PgDip (Environmental Engineering); PgDip (Physical Planning); LLM (Environmental Law and Practice), by Michael Brides BA, BAI, MSc, C.Eng., MIEI and by Paddy Kavanagh, BSc, PhD.

Roisin O'Donovan has over 30 years' experience in the fields of statutory planning and licensing and the preparation of Environmental Impact Assessment Reports. She has comprehensive knowledge of environmental and sustainability issues including

applicable legislation and standards. She is experienced in undertaking socio-economic assessments and has extensive experience in the development and implementation of Environmental Management Systems.

Michael Brides has over 17 years' experience as a geotechnical and structural engineer. Michael's experience covers a broad spectrum of geotechnical and structural engineering related expertise across multi sectors including large civil engineering earthworks development, onshore renewables, offshore renewables, large thermal generation, retail, medical and commercial. Michael is highly experienced in the civil engineering aspects of all phases of large civil engineering projects in particular development phases. He was co-author for the and was responsible for the co-ordination of the Soils, geology and Land chapter for the rEIAR for Derrybrien Wind Farm.

Paddy Kavanagh has 39 years' experience in planning, licencing and preparation of Environmental Impact Assessment Reports with comprehensive knowledge of environmental assessment, sustainability, legislation and environmental standards.

16.1.3 UN and EU Policy Context

The European Parliament in its February 2012 communication on the approach at an EU level to the prevention of natural and man-made disasters states that the main objective of disaster prevention is to safeguard human life, the safety and physical integrity of individuals, fundamental human rights, the environment, economic and social infrastructures, including basic utilities, housing, communications, transport and the cultural heritage.[2] It identifies key elements of the European Community approach to prevention of disaster such as creating inventories of information on disasters, developing guidelines and taking account of disaster prevention in Community legislation. It further notes that all types of natural and man-made disasters must be taken into account (and that these may include, among other hazards, floods, storms, droughts, tsunamis, earthquakes, forest fires, extreme temperature events, volcanic eruptions, avalanches, landslides, technological and industrial accidents, soil erosion, contamination of the subsoil and groundwater and pollution of the seas, lakes and rivers.

The 2012 communication recommended that issues relating to disaster prevention should be more fully included in the revision of the EIA Directive. Disaster prevention issues were subsequently dealt with explicitly in the 2014 EIA Directive amending the 2011 Directive and came into force on May 2017.

Recital (14) of the 2014 EIA Directive makes reference to the UN Hyogo Framework[3] (since superseded by the Sendai Framework[4]) which stressed the need for

[2] European Parliament resolution of 21 September 2010 on the Commission communication: *A Community approach on the prevention of natural and man-made disasters* (2009/2151(INI)), (2012/C 50 E/04)

[3] UN, "Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters",

[4] UNISRD, " Sendai Framework for Disaster Risk Reduction 2015-2030

assessment of the disaster risk implications of major infrastructure projects. The Sendai Framework is a 15-year, voluntary, non-binding agreement which recognises that Governments have the primary role to reduce disaster risk, but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. It aims for the substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

Recital (15) of the 2014 EIA Directive notes that in order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment.

Major infrastructure projects are not defined in the EIA Directive. However, It is noted that critical infrastructure is defined in EU Council Directive 2008/114/EC[5] as *'an asset, system or part thereof located in Member States which is essential for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have a significant impact in a Member State as a result of failure to maintain those functions.'*

Energy infrastructure is listed as critical infrastructure in the Department of Defence Strategic Emergency Management Guidelines.[6]

When completed, the Derrybrien windfarm comprised part of the energy infrastructure of the country contributing circa 9% of the National renewable electricity target at that time and as such can be regarded as critical infrastructure.

16.1.4 National Framework

The Strategic Emergency Management (SEM)[7] National Structures and Framework document and the associated Annexes were approved by Government on 26 July 2017. The SEM identifies 50 different emergency/incident types across a range of Lead Government Departments including *inter alia* environmental pollution, fires, landslides and aircraft incidents. It provides the basis for the National-level strategic emergency management and the supports required should a national-level response

[5] COUNCIL DIRECTIVE 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection

[6] Department of Defence, *"Strategic Emergency Management Guideline 3- Critical Infrastructure Resilience*", Feb 2019

[7] Department of Defence, *Strategic Emergency Management: National Structures and Framework,* October 2017

be warranted. The SEM provides that emergencies should be dealt with locally wherever possible.

16.1.5 Regional and Local Framework

The Framework for Major Emergency Management 2006 (MEM Framework)[8] guides the local and regional responses and inputs into the National-level responses and outlines the structures and processes followed by the Principal Response Agencies in managing a response to a Major Emergency. It is available on http://www.mem.ie together with other supporting guidelines, protocols and templates. The Principal Response Agencies are the Gárda Siochána, the Health Service Executive and Local Authorities.

The 2006 MEM Framework is currently under review by the Department of Housing, Planning and Local Government (DHPLG).

16.1.6 Definitions

The terms “major accident” and “disaster” are not defined in the EIA Directive, but are defined in UN, EU and National references.

The UN[9] definition of the term “disaster” is:

“A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts”.

The UN also distinguishes between the term “disaster” and “emergency” and notes that the term “emergency is sometimes used interchangeably with the term disaster, as, for example, in the context of biological and technological hazards or health emergencies, which, however, can also relate to hazardous events that do not result in the serious disruption of the functioning of a community or society”.

The UN definition of the term “hazard” is:

“A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation”.

The Seveso Directive[10] definition of the term “major accident” is as follows:

[8] Framework for Major Emergency Management 2006 (MEM Framework), http://mem.ie/wp-content/uploads/2015/05/A-Framework-For-Major-Emergency-Management.pdf

[9] UN General Assembly “*Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction*”, Dec 2016

[10] Original Seveso-1- Council Directive 82/501/EEC of 24 June 1982 on the major-accident hazards of certain industrial activities); Seveso-II Council Directive 96/82/EC of 9 December 1996 on the control of major-accident

"an occurrence such as a major emission, fire, or explosion resulting from uncontrolled developments in the course of the operation of any establishment covered by this Directive and leading to serious danger to human health or the environment, immediate or delayed, inside or outside the establishment, and involving one or more dangerous substances."

In the national context, the Framework for Major Emergency Management defines a major emergency as follows:

"A Major Emergency is any event which, usually with little or no warning, causes or threatens death or injury, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services in the area in which the event occurs, and requires the activation of specific additional procedures and the mobilisation of additional resources to ensure an effective, co-ordinated response".

The 2017 SEM notes that the term 'Emergency' shall be interpreted to include such terms as 'crisis', 'disaster' and 'catastrophe' which are often used interchangeably in international publications.

16.2 Methodology

16.2.1 General

The assessment has been undertaken based on guidance, published risk assessment methodologies and professional judgement.

16.2.2 Guidance

In undertaking this assessment, regard has been had to the following guidance:

- European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017[11]
- Draft EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, 2017[12]
- Wind Energy Planning Guidelines for Planning Authorities (Department of the Environment, Heritage and Local Government, 2006)[13].

hazards involving dangerous substances ; Seveso-III (Directive 2012/18/EU) Directive 2012/18/EU Of The European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

[11] European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017

[12] EPA, "*Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports",* August 2017

[13] DOEHLG, "*Wind Energy Development Guidelines for Planning Authorities"* 2006

- Draft Wind Energy Development Guidelines (Department of Housing, Planning and Local Government, December 2019)[14].
- Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Energy Consents Unit, Scottish Government 2017)

It is noted that the peat slide that occurred during construction of the Derrybrien Wind Farm Project is cited as an example in EC Guidance[15] of the need to consider the adverse impacts of natural disaster/risks when constructing a Project. The consideration of ground stability in EIA Guidance is outlined below.

16.2.3 Overview-Risk Assessment

The 2017 EC Guidance[16] advises that disaster/accident risk assessment in EIAs should address issues such as:

- What can go wrong with a Project?
- What adverse consequences might occur to human health and to the environment?
- What is the range of magnitude of adverse consequences?
- How likely are these consequences?
- What is the Project's state of preparedness in case of an accident/disaster?
- Is there a plan for an emergency situation?

The Draft 2017 EPA Guidelines[17] advises that the extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk).

A risk-based approach has been used for the assessment which covers the identification, likelihood and consequence of major accidents and/or natural disasters. The assessment utilises the risk classification set out in the 2010 guidance produced for Principal Response Agencies by the Department of Environment, Heritage and Local Government (DOEHLG) in relation to emergency management.[18]

[14] DHPLG, *"Draft Wind Energy Development Guidelines"* , December 2019

[15] European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017

[16] European Commission, "Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)", 2017

[17] EPA, "*Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports",* August 2017

[18] Department of the Environment, Heritage & Local Government, *"A Framework for Major Emergency Management- Guidance Document 1-A Guide to Risk Assessment in Major Emergency Management"*, January 2010

The risk assessment process is comprised of a number of stages.

1. Establishing the Context - the characteristics of the Project location including the geography, populations and infrastructure of the area are described
2. Hazard Identification- the potential natural hazards in the vicinity of the Project site
3. Risk Assessment – consideration is given to the overall risks presented by the identified hazards.
4. Recording identified potential hazards on a Risk Matrix

The criteria for classification of likelihood is outlined in Table 16-1.

Table 16-1: Classification of Likelihood

Ranking	Category	Description
1	Extremely unlikely	May occur only in exceptional circumstances, once every 500 or more years
2	Very unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communities; and/or little opportunity, reason or means to occur; may occur once every 100-500 years.
3	Unlikely	May occur at some time; and/or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisations worldwide; some opportunity, reason or means to occur, may occur once per 10-100 years.
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence and will probably occur once every 1-10 years
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probably occur more than once a year.

The ranking of impacts in the DOEHLG guidance is presented in Table 16-2

Table 16-2: Ranking of Impact

Ranking	Classification	Impact	Description
1	Minor	Life, Health & Welfare	Small number of people affected; no fatalities and small number of minor injuries with first aid treatment.
		Environment	No contamination, localised effects
		Infrastructure	< 0.5m Euro.

Ranking	Classification	Impact	Description
		Social	Minor localised disruption to community services or infrastructure (<6hours)
2	Limited	Life, Health & Welfare	Single fatality, limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements.
		Environment	Simple contamination, localised effects of short duration.
		Infrastructure	0.5-3m Euro
		Social	Normal community functioning with some inconvenience.
3	Serious	Life, Health & Welfare	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation.
			Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External resources required for personal support.
		Environment	Simple contamination, widespread effects of extended duration
		Infrastructure	3-10M Euros
		Social	Community only partially functioning, some services available.
4	Very serious	Life, Health & Welfare	5 to 50 fatalities, up to 100 serious injuries, up to 2000 evacuated
		Environment	Heavy contamination, localised effects or extended duration
		Infrastructure	10-25M Euros
		Social	Community functioning poorly, minimal services available
5	Catastrophic	Life, Health & Welfare	Large numbers of people impacted with significant numbers of fatalities (>50), injuries in the hundreds, more than 2000 evacuated.
		Environment	Very heavy contamination, widespread effects of extended duration.
		Infrastructure	> 25M

Ranking	Classification	Impact	Description
		Social	Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

For the purpose of this assessment, it is assumed that the DOEHLG impact rankings very serious (Ranking 4) and catastrophic (Ranking 5) in Table 16-2 equate to the UN definition of a disaster and DOEHLG definition of a major emergency.

The criteria for classification of likelihood and the ranking of impact are as outlined in Table 16-1 and Table 16-2 respectively are used to position all the identified hazards on a risk matrix. The risk rating (R= Likelihood x Impact) is utilised as shown in Figure 16-1 which gives a visual representation of the criticality of the identified risks.

Figure 16-1: Emergency Risk Rating Matrix

Likelihood							
	Very Likely	5					
	Likely	4					
	Unlikely	3					
	Very unlikely	2					
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5
			Consequences				

The risk matrix is colour coded to provide a broad indication of the critical nature of each risk:

- The red zone represents ‘high risk scenarios’;
- The amber zone represents ‘medium risk scenarios’; and
- The green zone represents ‘low risk scenarios

16.2.4 Ground stability in EIA Guidance

The consideration of the original consents for the Derrybrien Wind Farm Project[19] predated guidelines which subsequently informed consideration of ground stability in

[19] EIS submitted with GCC Reg. Ref. 97/3470 / ABP Reg. Ref. PL.07.106290 – ‘the Phase 1 EIS’, EIS submitted with GCC Reg. Ref. 97/3652 / ABP Reg. Ref. PL.07.106292 – ‘the Phase 2 EIS’, EIS submitted with GCC Reg.

EIA in Ireland and the UK. Ground stability was specifically identified as an issue to be addressed in EIA in both the EPA 2002 Guidelines[20] and the Institute of Geologists of Ireland (IGI) 2002 Guidance[21].

The requirement for a landslide and slope stability risk assessment for wind farm sites for all stages of a wind farm project, with proposed mitigation measures where appropriate (including consideration of the possible effects related to the storage of excavated material) was set out in the Department of Environment, Heritage and Local Government (DoEHLG) Planning Guidelines in relation to Wind Energy Development Guidelines in 2006.[22]

The Draft Planning Guidelines issued by the Department of Housing, Planning and Local Government in December 2019 [23] recommend that reference should be made to the National Landslide Susceptibility Map to confirm ground conditions are suitable for a project.

In the 2016 the Irish Landslides Working Group compiled a comprehensive database of landslide events in Ireland, which is now publicly available in an interactive web GIS viewer. The GSi landslide susceptibility map identifies areas which are subject to landslides and is measured from low to high. The map takes into account where the landslides occur and what causes them (slope, soil type and the impact of the flow of water in an area). It is available in digital format for download and can be viewed online at the GSI's dedicated Landslide Viewer along with GSI's National Landslide Database and a summary report (https://www.gsi.ie/en-ie/programmes-and-projects/geohazards/projects/Pages/Landslide-Susceptibility-Mapping.aspx).

The draft guidelines suggest that if developments in upland sites are proposed, the application should be accompanied by a statement from a geologist, a hydro-geologist or an engineer with expertise in soil mechanics.

The National landslide susceptibility map for the Project area shows that much of the wind farm site would be classified as being of **Low** susceptibility to landslides. There is a broad area on the steeper slopes on the south side of the wind farm and across the turbary plots on the east side of the wind farm where the susceptibility is classified as **Moderately Low**. This includes the area where the peat slide occurred at Turbine T68 in October 2003, during construction of the wind farm. The location and extent of the peat slide are recorded on the GSI database.

The Landslide Susceptibility Map indicates that conditions on the windfarm site are suitable for the project with appropriate design and mitigation measures for working in peat, particularly in the areas of Moderately Low susceptibility. The areas of

Ref. 00/4581 / ABP Reg. Ref. PL.07.122803 – 'the Phase 3 EIS', collectively as 'the Original Environmental Impact Statements' or the 'Original EISs'.

[20] EPA, "*Guidelines on the information to be contained in Environmental Impact Statements*", March 2002

[21] IGI, "*Geology in Environmental Impact Statements-A Guide*", Sept 2002.

[22] DoEHLG, "*Planning Guidelines in relation to Wind Energy Development Guidelines*", 2006

[23] DoHPLG, "*Draft Revised Wind Energy Development Guidelines",* Dec 2019

Moderately High and **High** susceptibility are generally limited to the steeper slopes to the north and south and outside of the wind farm site, particularly to the north.

The stability of the site and associated infrastructure over the lifetime of the project and following decommissioning has been assessed in Chapter 10 of this rEIAR and has been undertaken by suitably competent and experienced geotechnical engineering professionals. This assessment is reliant upon output from a Peat Stability Risk Assessment, where relevant to inform the rEIAR assessment. The Peat Stability Risk Assessment (Chapter 10, Section 10.2.4) has been undertaken in accordance with the guidelines as presented in Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (Energy Consents Unit, Scottish Government 2017). The mitigation implemented to end of Q2 2020 by ESB on site and to be implemented as recommended in Chapter 10 for the remainder of the project life, including decommissioning is also presented in detail in Chapter 10.

16.2.5 Peat stability risk assessment

The peat stability risk assessments (Chapter 10, Section 10.2.4) undertaken for the current remedial Environmental Impact Assessment Report (rEIAR) are very detailed and were not standard practice in 1998; the initial guidance on Peat Stability Risk Assessment (PSRA) was first published in 2006 by the Scottish Executive. [24] referencing the peat slide at the Derrybrien Wind Farm (Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, December 2006).

The Guidance in relation to peat slide risk assessment at the EIA stage for consent applications published by the Scottish Executive in 2006 was developed to provide best practice information on methods for identifying, mitigating and managing peat landslide hazards and their associated risks.

At the stage when the original consent applications were being prepared for the Derrybrien Wind Farm Project, the assessment and design of wind farms in peat was not well developed. Following the Derrybrien peat slide event in 2003, the notable limitations in wind farm design and construction were recognised and this set in motion a change in industry practise, including the publication of the Scottish Executive guidelines in 2006.

Notably it is documented in these Scottish Executive Guidelines that “Typically, slope instability and landslide hazard assessments have followed a standard approach, detailed in a number of statutory and guidance documents (e.g. BS5930, 1999; DoE, 1990; 1996). However, previous investigations have illustrated that the geotechnical controls of peat landslides are distinct to organic soils (dry peat is typically 90% -95%

[24] Scottish Executive: *“Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments*”, Dec 2006

organic matter) and that pre-conditions for failure are not well accounted for by site investigation methods detailed in existing documentation…….Therefore, supplementary guidance is required to ensure that accurate and realistic peat slide hazard and risk assessments can be undertaken during the planning of upland electricity generation developments such as wind farms."

This gives a clear indication of the level of understanding and assessment of peat stability prior to this publication in 2006.

An updated version of these Scottish guidelines was published by the Scottish Executive in 2017[25] to reflect new research and publications. As set out in Chapter 10 current practice in Ireland in relation to undertaking peat stability risk assessments is broadly based on 2017 Scottish guidance along with a number of other geotechnical publications.

The peat stability risk assessments in this rEIAR have used methodologies based on the 2017 Scottish Guidelines and have benefited from the availability of significant amounts of site investigation data which was acquired through various site investigation campaigns on the site as a consequence of the 2003 peat slide. They incorporate an extensive body of knowledge on the mechanism and cause of peat slides acquired since the 2003 event. This data is provided in detail in Chapter 10 and its appendices.

The Peat Stability Risk Assessment (PSRA), detailed in Chapter 10, undertaken for the wind farm site, the peat slide response works and ancillary works, and the grid connection and ancillary works are consistent with *"Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects"*, 2nd Edition, April 2017 (Scottish Government – Energy Consent Unit, 2017). Various assessment methodologies are permitted under the Guidance and for the Derrybrien Wind Farm Project the most appropriate of the methodologies outlined in the guidance has been adopted for the various elements of the Project. These methodologies are outlined in detail in Chapter 10. This provides the likelihood for peat instability for the various site works or activities across the project site based on the local site conditions. The corresponding likelihood is used for the purposes of the assessment of major accidents.

It is important to note that the peat stability risk assessment does not provide a direct assessment of the probability of a peat slide of the scale which would constitute a major accident. It is an engineering qualitative assessment which assesses the relative risk of a peat slide occurring based on a combination of contributory factors.

For the purposes of the PSRA the wind farm site has been divided into 71 no. zones and a likelihood of a peat slide has been assessed for each zone The likelihood provided for each zone is generally representative of the worst conditions within that

[25] Scottish Government*, "Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments",* Prepared for Energy Consents Unit, Scottish Government Second Edition, April 2017

zone but with a greater emphasis applied to the site conditions along the corridor of the wind farm infrastructure, where the majority of the site activities related to the wind farm occurred.

The assessment takes account of the combination of the key contributory factors to assess the likelihood of peat instability (loading, the soil conditions, the topographical conditions and the hydrological conditions).

Only the works or activities which could likely result in a Major Accident are considered in this Chapter.

It is necessary to highlight that the extent of the peat slide which occurred on the Derrybrien Wind Farm in 2003, which would be considered large (c. 25 Ha), was not a consequence of the activity alone that was being undertaken at the time; the combination of local site conditions where the peat was loaded and downslope of that location have been identified as contributory factors to the failure and extent. The influence of the topographical and hydrological factors on the likelihood and potential scale of the slide has been demonstrated on other areas of the wind farm site where activities similar to the peat slide site occurred (i.e. side casting of material on to peat with slopes similar to that which is understood to have triggered the large slide) resulted in only very localised bearing failure of the peat which did not develop into slide events. In fact, prior to the peat slide in 2003, there were no peat failures in approximately 90% of the side cast areas with a local bearing failure occurring at three turbine material side cast areas and a small slide at a further turbine, see Chapter 10, Section 10.3.2.1.1.3.1. For the second phase of construction in 2004/2005, after the peat slide, alternative methods of managing and disposing of material excavated from the site of the turbines, crane hardstandings, substation, borrow pits and other minor infrastructure and civil works were adopted as a preventative design mitigation measure to reduce the likelihood of a peat slide.

For the purposes of this assessment a conservative approach has been taken where the onerous outcome of a possible peat failure has been considered in assessing the impact of the failure for each phase regardless of the actual potential scale of a resulting slide, which would be limited by the downslope topography.

As demonstrated in Chapter 10 the likelihood of a peat slide of scale occurring for the Grid Connection works or the Peat Slide Response works are considered to be considerably lower than on the wind farm site. This is mainly due to peat depths, site topography and the nature of the activities that were undertaken for these aspects of the project. Furthermore, the potential for an instability event to develop into a peat slide of scale along the grid connection and at the various locations of the Peat Slide Response works is considered low based predominantly on the topography of these areas of the Project site and proximity to significant watercourse and rivers.

16.3 Difficulties Encountered

The assessment of major accidents and disasters is being carried out post the construction of the Project which was constructed between 2003 and 2006 and has been operational since that. Incidents which occurred in that time frame, such as the peat slide in 2003, vehicular accidents and a gorse fire which were logged and investigated have been used to qualify the assessments. Reliance has been placed on historic reports of the peat slide and subsequent investigations including more detailed site investigation and geotechnical supervision which took place in the second phase of construction which provide an adequate basis for assessment. Although the time interval between construction and this assessment is significant sufficient information and data exists to undertake the assessment adequately and no difficulties were encountered in undertaking this assessment.

16.4 Receiving Environment

The receiving environment at the baseline year of 1998 is described for the range of EIA topics throughout the rEIAR.

The aspects of the receiving environment are ordered as set out in MEM guidance for the purpose of a major accident and/or natural disaster assessment as follows:

- the social context,
- environmental receptors,
- extent of infrastructure and the
- presence of hazardous facilities.

16.4.1 Social

Population: As described elsewhere in this document (see Chapter 2 Description of Project and Chapter 4, Population and Human Health), the wind farm is in a remote location and the nearest occupied houses are located approximately 2km from the wind farm site. The nearest village is Derrybrien which is located along the R353 Regional Road approximately 2km downslope from the south side of the site. The estimated population in Derrylaur Electoral Division, within which Derrybrien village is located, was 113 in 2006 and 105 in 2016.

The grid connection is also in a rural location with the closest houses located at approximately 0.38km from the overhead line route and approximately 0.54km from Agannygal Substation. Likewise, the works undertaken in response to peat slide are not in the vicinity of occupied houses.

There is a derelict house which was unoccupied prior to construction of the Project and has not been occupied subsequently. The derelict house is located 0.49km from the site of the peat slide and 0.25km from the OHL site

Primary Economic Drivers: Land use within and in the vicinity of the Project site was and is limited to commercial forestry on the sides of Cashlaundrumlahan mountain, some areas of turbary, and with some agriculture on the lower slopes at

the base of the mountain around Derrybrien Village. The economy in the vicinity of the Project site was and is based on agriculture and forestry.

Principal Emergency Services: The wind farm is not located close to major population centres or locations which provide essential community services. There were and are no hospitals in the vicinity of the Project site. The nearest ambulance Station, Garda Station and fire station were and are located in Loughrea, Co. Galway (approximately 11km from wind farm site). The closest hospitals are University Hospital Galway (UHG) (approximately 34km from wind farm site) and Portiuncula Hospital Ballinasloe (approximately 35km from wind farm site).

16.4.2 Environment

Terrain and Landuse: The Derrybrien Wind farm site is located on the upper slopes of Cashlaundrumlahan Mountain within the Slieve Aughty Mountains. The site is located at altitudes of 320m to 365m. The Slieve Aughty Mountains has two main peaks, Cashlaundrumlahan and Sonnagh Old, which has a peak of 328m and is located to the north of the Derrybrien Wind Farm site.

The wind farm site is characterised by degraded upland blanket bog which in 1998 was largely used for commercial forestry over the central and western parts of the site, and peat harvesting in turbary plots on the east side of the site.

River Catchments: The site partially extends over the catchments of three rivers, the Boleyneendorrish and Owendalulleegh in the Kinvarra catchment and Duniry in the Shannon catchment. The Owendalulleegh River System drains approximately two-thirds (67%) of the site. The Boleyneendorrish River drains approximately 31% of the site. The Duniry River drains a very small section of the overall site (<1%) to the northeast. The Owendalulleegh River forms the upper catchment of the system from which the Gort water supply is abstracted (at the Cannhowna River).

Designated Sites: Derrybrien Wind Farm is within the Slieve Aughty Mountains Special Protection Area (SPA) which was classified as an SPA in March 2007 and formally designated by Statutory Instrument in March 2012. The SPA is designated for the protection of Hen Harrier and Merlin. There are 15 other European sites within 15km of the wind farm sites, three of which hold both SPA and SAC designations.

Cultural Heritage:

There are no extant archaeological sites or architectural heritage structures located within the wind farm site and nothing of archaeological significance was identified in any area of the site during construction (see Chapter15, Cultural heritage). There are no recorded archaeological sites within 400m of the wind farm boundary and there are no National Monuments or archaeological sites subject to Preservation Orders located within the 3km study area. There are also no monuments with potential visual alignment attributes, such as megalithic tombs or stone circles, located within the 3km study area. No structures of architectural heritage significance were identified within the wind farm site and none of the structures located within 2km of its boundary are listed as Protected Structures or are included in the NIAH. No potential architectural heritage structures (whether designated or not) were identified during the pre-development assessments of the wind farm.

16.4.3 Natural Hazards

Flood Risk: The Project is not located within an area of flood risk. (See Chapter 11-Hydrology and Hydrogeology and associated Appendix 11-1-Flood Risk Assessment)

Forestry/bog/gorse fires: The Slieve Aughty Mountains has some of the largest concentrations of coniferous forest in the country which was mainly planted prior to 1998.

Forestry/bog/gorse fires arise from:

- Prescribed burning of vegetation
- Uncontrolled burning/wildfires

Prescribed burning of land to clear scrub and other unwanted vegetation is a form of farm management.[26] The objective of prescribed burning includes for example forage improvements, turbary management or fuel (vegetation) load reduction. [27]

The majority of uncontrolled burning incidents in Ireland occur within specific geographical locations, e.g. upland commonages.[28] Based on recent fire incidents, most ignitions risks appear to be associated with illegal burning of upland vegetation.[29]

Fire Authority records 2000-2010 suggest that counties particularly at risk from fire are Counties Galway, Donegal, Wicklow, Wexford, Kerry, Mayo, Clare, West Cork and Sligo.

Given the amount of vegetation (fuel) in the area surrounding the wind farm there is a risk of fire in the area. If a fire did encroach on the windfarm it could lead to significant economic costs, loss of renewable energy generation available to the State, loss of carbon displacement and decommissioning and reconstruction activity with potential to impact on the environment (carbon cost, noise, water quality transport etc.).

Peat slides: A peat slide occurred during construction of the wind farm in 2003. The history of peat slides is discussed in Section 16.4.3.1

[26] The Land and Forest Fires Working Group, Recommendations approved by Minister of State, Sean Connick, T.D, Jan 2011

[27] Department of Agriculture, Food and the Marine, Prescribed Burning Code of Practice - Ireland

[28] Department of Agriculture, Food and the Marine, Forest Fire Risk Warning System

[29] DAFM, Fire Danger Notice 02 of 2020, Issue date: 27 March 2020 @ 1200hrs

16.4.3.1 History of Peat slides

In the main, peat slides in Ireland have been as a result of natural and anthropogenic factors. More recently[30] it has been recognised that the factors that influence the susceptibility of an area to peat slide(s) are not necessarily those which would have a corresponding influence on the stability of mineral soil or rock slopes. The main factors which contribute to peat slides have been identified as follows:

- Topography – elevation, slope angle and typically downslope profile
- Hydrology and hydrogeology – natural and man-made
- Peat conditions – depth, strength, integrity
- Subsoil conditions
- Loading and unloading – natural and man-made

At the time of the peat slide at the Derrybrien Wind Farm in 2003 the construction industry's general knowledge of failures of peat slopes on wind farms was very limited. While there had been some failures previously, these generally remained largely unreported and none were of the scale or impact of the slide that occurred at Derrybrien. The Derrybrien peat slide was an unprecedented event and is still the largest recorded peat slide to have occurred, in terms of volume of peat, in Ireland or the UK.

The peat slide at Derrybrien stimulated numerous investigations, research projects and publications into peat slope failures in Ireland and the UK which have greatly increased the knowledge of the behaviour of peat and of peat failures on upland blanket bogs.

In the UK this peat slide among others led to the publishing of the notable Scottish Executive document, discussed above: ("*Peat Landslide Hazard and Risk Assessments – Best Practice Guide for Proposed Electricity Generation Developments"* in 2006).

In Ireland, following the Derrybrien and Poullathomas landslides in 2003 the Geological Survey of Ireland established the Irish Landslides Working Group in 2004.

The failures at Derrybrien and Poullathomas are described briefly below. The peat slide in Derrybrien is discussed further in Chapter 10 of this rEIAR. Further information with regards to the impact of the slide is discussed in Section 16.5.2.

Derrybrien Wind Farm Peat Slide

Over 450,000m^3 of blanket bog was disturbed in the slide over an area of approximately 25 Hectares on the forested slopes on the south side of the wind farm. Approximately 250,000m^3 of the disturbed peat moved downslope from the slide area, broke up and entered the natural drainage channel for the watercourse in subcatchment SC7(b) (as defined in Chapter 11 – Hydrology and Hydrogeology) as a viscous flow of fluidised remoulded peat debris. Some of this material was

[30] Scottish Executive: "Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments", Dec 2006

deposited in lobes on flatter ground to either side of the channel upslope from the Black Road Bridge. A proportion of the debris moved further downslope along the stream channel below the bridge ultimately reaching the Owendalulleegh River, approximately 5.25 km downstream from the site.

The movement of the debris along the stream channel occurred in pulses in the days and weeks following the slide in response to subsequent rainfall events, which remobilised the peat debris in the upper reaches of the stream when surface runoff entered the channel.

The material that remained within the failure scar on the upper slopes and wind farm site was typically comprised of detached rafts of intact peat, remoulded peat debris and a thin cover of intact basal peat over the underlying mineral soil and rock. Sections of the site access tracks on the south side of the wind farm were also damaged in the slide and had to be re-constructed. Over time, surface runoff and groundwater has become concentrated along natural drainage channels within the slide area, increasing the level of drainage to the blanket bog on the surrounding slopes.

Applied Ground Engineering Consultants, Ltd. (AGEC) carried out an inspection and supplemental investigations on the site at the time of the slide to provide an opinion on the likely cause of the failure. A copy of their report – "*Derrybrien Windfarm – Final Report on Landslide of October 2003*" – is included in Appendix A of Chapter 10.

The peat slide was initially reported to have occurred immediately downslope of Turbine T68 on the southern slopes of the windfarm, and AGEC have identified this as the likely initiation point for the slide. The slopes in the upper area of the peat slide have been recorded as 3^{o} – 5^{o}. At the time of the failure, peat was being excavated from the site of the turbine and the arisings were being placed or "side cast" onto the intact peat slopes on the downslope side of the turbine and floating road. Other drainage works were being carried out along the floating road within the slide area approximately 300m downslope from T68.

AGEC concluded that the construction activity, and particularly the placing of arisings onto the intact peat slopes, most likely triggered the slide. The failure mechanism that they proposed is shown schematically in Figure 16-2. The additional surcharge load on the intact peat slopes could have initially caused a localised shear failure in the underlying intact peat, which would have reduced its shear resistance and resulted in a redistribution or transfer of lateral load to the adjacent peat downslope. Additional transfer of lateral loading as more material was placed on the slopes could have led to a progressive shear failure and reduction in shear resistance along the base of the peat further downslope. Ultimately, this could have led to the large planar or translational peat slide that occurred on the inclined slopes.

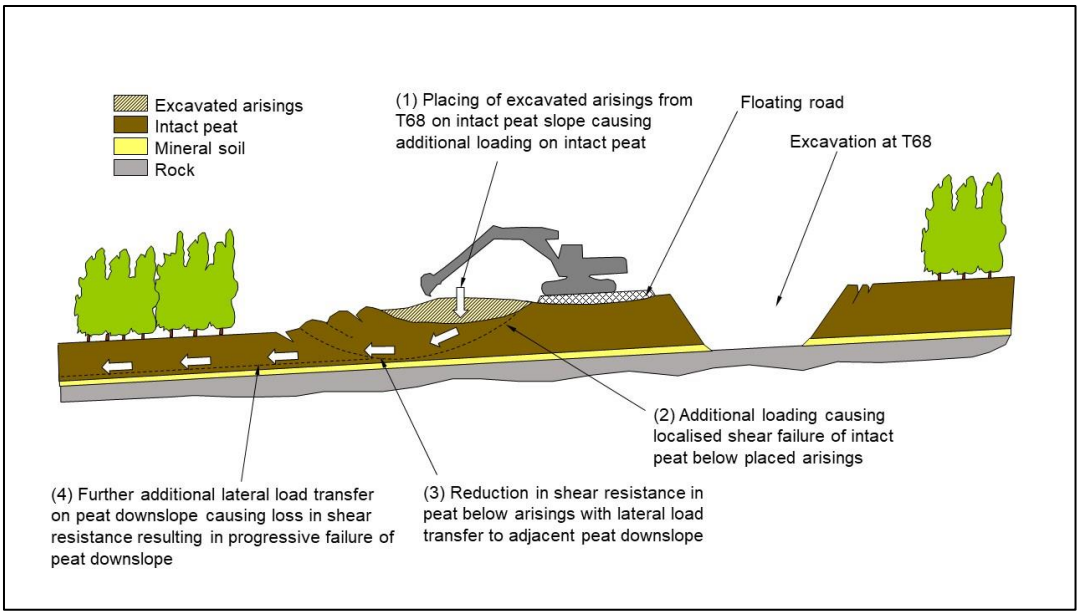


Figure 16-2: Schematic of likely failure mechanism of 16th October peat slide

Based on their investigations into the failure, AGEC have identified additional contributory factors that would have made the slope predisposed to failure in that area including, *inter alia*:

- Its location within a shallow valley along a natural drainage line where there would likely have been a concentration of both surface and sub-surface water flow;
- A zone of weaker peat at depth within the centre of the drainage line;
- The additional surcharge load from the floating road at the top of the slide, which was constructed directly on the intact peat slopes;
- The drainage works that were being carried out within the slide area approximately 300m downslope from the turbine; and
- The existing furrows and drainage lines within the conifer forests which would have dissected the vegetative upper layers of the peat creating lines of weakness within the peat mass.

<u>Poullathomas (also known as Pollatomish) Peat Slide</u>

The following provides a summary of the Poullathomas peat slide based on a review of the paper "*Analysis of the peat slide at Pollatomish, County Mayo, Ireland"* by Long and Jennings (2006).

The peat slide event consisted of 50 individual events and these took place on the night of the 19th September 2003 on the Dooncarton Mountains in Co. Mayo below the 250m AOD summit. The slides took place on the southern and northern slopes and in total involved the failure of approximately 200,000m^3 of material.

Prior to the slides there had been an intense period of rainfall on the evening of the 19th September 2003 which had been preceded by the a relatively dry summer period. The areas of the slides contained peat of depths between 0.3 and 0.9m. the evidence following the slide suggested that the failures occurred in both the mineral soils and weathered rock beneath the peat and in the peat layer.

It is postulated that the period of dry weather is likely to have dried the peat such that there would have been an appreciable loss of weight of the peat (unloading) and cracking of the peat. When the intense rainfall occurred, this led to rapid increase in the water pressure at depth in the peat and in the underlying soils and this, coupled with the reduction in the effective stress due to the reduction in weight of the peat, resulted in the loss of frictional resistance that led to the peat slides

Most of the slides occurred in the soils beneath the peat and it is estimated that 11 of the slides occurred in the peat layer. These 11 slides typically occurred on the lower slopes and are considered to have been triggered as a result of debris from the upper failures.

As the failures occurred during the night, activities would not have been taking place at the time of the slide.

It is particularly noteworthy that the slopes on which the failures occurred had angles of between 22° and 58° and 12° to 35° for the upper and lower slopes respectively and are considerably steeper than slopes where the Derrybrien slide occurred.

Landslide Susceptibility Mapping

In 2006 the report 'Landslides in Ireland'[31] was published by the Landslides Working Group which outlined a number of topics related to landslides and their context in Ireland including the geotechnics of landslides, landslide mapping, landslides and planning, research and recommendations for future work.

As stated in the Section 16.2.5 above, in 2016 the Irish Landslides Working Group compiled a comprehensive database of landslide events in Ireland, which is now publicly available in an interactive web GIS viewer.

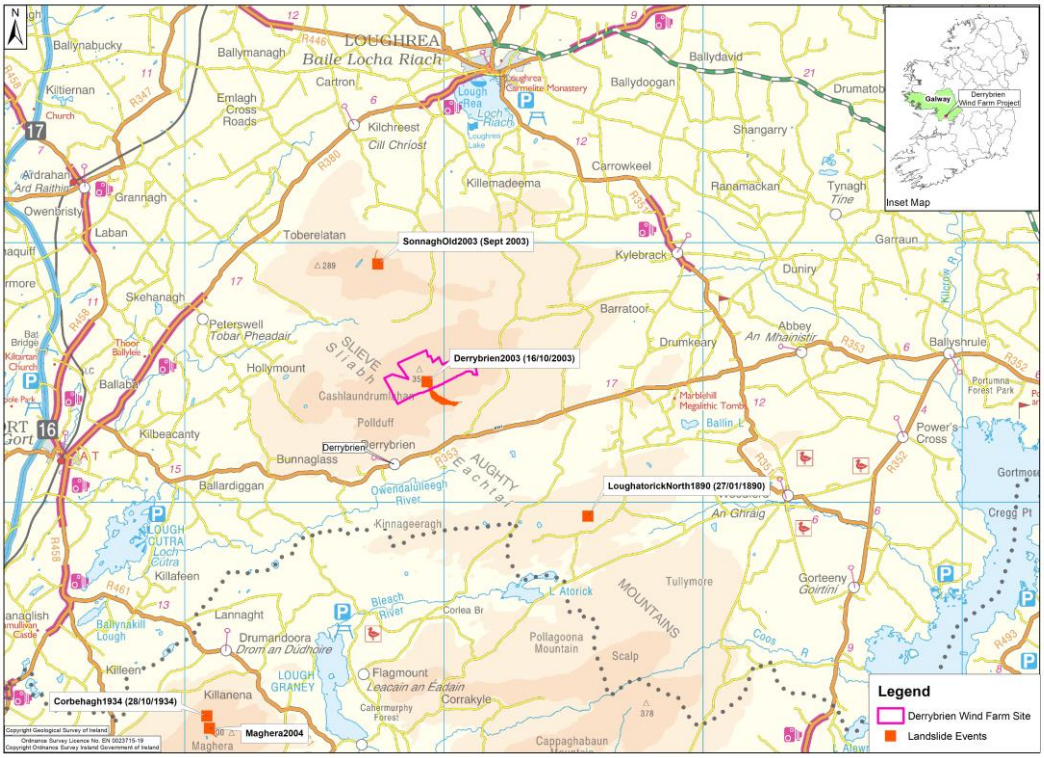
It includes landslides in mineral soil and rock on steep slopes as well as peat slides. While the GSI Landslide Susceptibility Mapping provides a useful coarse assessment of landslide susceptibility and landslide records, for the purposes of peat stability risk assessment is not considered in practice as a primary tool for assessment of the likelihood of peat instability.

Utilising the currently available landslide database, the peat slides that had occurred prior to 1998 in the Slieve Aughty Mountains and vicinity were at:

- Loughatorick North, Slieve Aughty Mountains (1890)
- Corbehagh (Oct 1934) (Maghera Mountain)

[31] GSI *"Landslides in Ireland"* (2006) (Ed. Ronnie Creighton, GSI)

Figure 16-3: Landslides in Slieve Aughty Mountains (Source GSI, accessed Mar 2020)



The Loughatorick North (1890) and Corbehagh events (1934) which occurred were in a different part of the Slieve Aughty mountain range to the south of the R353 Regional road. No human factor was noted in the landslide database in relation to these peat slides which may have occurred naturally.

In relation to wind farms, no peat slide of the scale and impact of the Derrybrien peat slide was reported as occurring during the wind farm development in Ireland or in the UK prior to 1998. While there may have been other peat slides on wind farms in the country, there is no record of these slides having been reported prior to 1998.

Following the consenting of Derrybrien Wind Farm in 1998-2001 a peat slide occurred during the construction of the adjacent Sonnagh Old Wind Farm in September 2003 a month before the Derrybrien peat slide which was of smaller scale and not widely reported. This is discussed further in Section 16.6.

A peat slide also occurred in 2004 at Maghera Mountain in County Clare to the south west of Derrybrien with no apparent impact. No human factor was noted

16.4.4 Infrastructure

As set out in Chapter 2, the main infrastructure in the general area comprises the road network and energy infrastructure.

Roads: The major routes include the M18 motorway to the West, the former N18 national primary road passing through Gort and which is now the R458 regional road N17and M6. There is a low level of usage of the local road (the Black Road) which

branches off the R353 between Gort and Portumna and leads to Lough Rea and from which the site entrance is accessed.

Airports: There are no airports in the immediate vicinity of the Project. Airport is located circa 95km to the south west in County Clare and Galway Airport is located circa 40km to the northwest in County Galway.

Water Supply: Prior to the wind farm development up to the present time, the nearest public water supply scheme is the Gort Regional Water Supply Scheme (RWSS). The water treatment plant is located in the townland of Rindifin to the east of Gort.

The water supply from the RWSS is derived from a combination of both groundwater supplies and surface water sources. The surface water supply comes from the Cannahowna River which emerges from a subterranean cavern (Polldouagh) on the west side of the Gort. The Cannahowna River is a continuation of the Beagh River, Lough Cutra and the Owendalulleegh River.

Power generation, transmission and distribution: The following power generation facilities are located in the general area:

- Sonnagh Old Wind Farm (constructed circa 2004) located approximately 2.5km north northwest of Derrybrien Wind Farm which comprises nine Vestas V 25 850 turbines. As noted in Chapter 1, Sonnagh Old was granted planning permission in October 2000 (GCC Reg. Ref. 00/3234) and constructed in 2003-2005.
- Tynagh Generating Station, which is over 10km from the Derrybrien site, is a gas fired power station which was permitted after the Derrybrien Project. As noted in Chapter 1, Tynagh Generating Station was granted planning permission in 2003 and constructed in 2004-2005.

The electricity network in the vicinity of the site in 1998 includes the following transmission lines:

- Moneypoint - Oldstreet 400kV OHL
- Ennis - Shannonbridge 110kV OHL

There are distribution and low voltage overhead line connections throughout the area.

Other Infrastructure: There are no medical facilities, educational establishments, head offices of large public or commercial concerns in the vicinity of the Project site.

16.4.5 Hazardous Sites

The Seveso Directive[32] is aimed at preventing major accidents involving dangerous substances and limiting the consequences for humans and the environment in the

[32]Original Seveso-1- Council Directive 82/501/EEC of 24 June 1982 on the major-accident hazards of certain industrial activities); Seveso-II Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances ; Seveso-III (Directive 2012/18/EU) Directive 2012/18/EU Of The European Parliament and of the Council of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

event of such an occurrence. It applies to industrial establishments in the European Union where dangerous substances are used or stored in large quantities.

Derrybrien Wind Farm is not a Seveso site and is not located within the vicinity of a Seveso site.

Tynagh Power Station approximately 15km from the Project site is a lower tier Seveso site. There are only two upper tier Seveso sites in County Galway one located in Oranmore and one in Galway City. The Colas Bitumen Emulsion (West) Ltd site in Oranmore has been identified as an upper tier Seveso II site[33]. Currently there is one Seveso III site within Galway city, Topaz Energy Galway Terminal located in New Docks, Galway Harbour Board Enterprise Park. It is classified as an upper tier establishment[33].

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https://www.hsa.ie/eng/your_industry/chemicals/legislation_enforcement/comah/list_of_establishments/upper_tier_sites_5th_may_2020.pdf

16.5 Impact of the Project

16.5.1 Identification of hazards/risks

Risks have been reviewed through the identification of plausible risks in consultation with relevant specialists. The identification of risks has focused on hazards that have occurred, are occurring or could occur associated with project construction, operation and ultimate decommissioning which could conceivably give rise to a major accident or disaster.

In accordance with the European Commission Guidance[34], project risks should be identified over the project lifecycle in respect of the:

- Potential vulnerability of project to disaster risks; and
- Potential to cause accidents and/or disasters.

The likelihood rating utilised reflects the actual record of incidents over the construction phase and operation phase to date together with risk assessments using current methodologies. The risks/hazards identified are discussed briefly below and summarised in **Table 16-3**, **Table 16-4** and **Table 16-5**.

The risks/hazards identified over the project lifecycle are:

- Peat slide during all phases of the project
- Vehicular accidents on site and surrounding road infrastructure during construction
- Small aircraft hazard with wind turbines during project operation
- Forestry/bog/gorse fire during all phases of the project

Peat Slide:

The peat stability risk assessment (PSRA) for the Wind Farm site is presented in Chapter 10 - Soils, Geology and Land. This has been undertaken for each phase of the project, Baseline/Phase 1 of Construction (2003), Phase 2 of Construction (2004-2005), Operation and Maintenance Phase to 2020, and Operation and Maintenance 2020 to Decommissioning Phase c. 2040.

For the purposes of the PSRA the site has been divided into 71 no. zones and a likelihood of a peat slide has been assessed for each zone The likelihood provided for each zone is generally representative of the worst conditions within that zone but with a greater emphasis applied to the site conditions along the corridor of the wind farm infrastructure, where the majority of the site activities related to the wind farm occurred. This likelihood rating is then compared to the rating descriptors in Table 16-1 to provide a corresponding rating in accordance with the 2010 guidance produced for Principal Response Agencies by the Department of Environment, Heritage and Local Government (DOEHLG).

[34] European Commission, “Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)”, 2017

Prior to construction and without mitigation, the likelihood of a peat slide occurring at the wind farm site based on the peat stability risk assessment ranged from possible to likely. In accordance with the classification set out in Table 16-1 this has been assessed as equating to **likely**. This is based on the fact that most of the infrastructure (majority of the floating site access tracks and 39 of 70 no. turbine foundations) had been constructed prior to the slide on 16th October 2003, and there had been a number of localised failures of the peat during these works as described in 16.2.5 above.

For the second stage of construction i.e. following the peat slide in 2003, significant mitigation was implemented for the remainder of the construction period. The key mitigation measures can be summarised as follows:

- Additional geotechnical investigations, stability analyses, testing, monitoring and geotechnical supervision during the construction stage of the project (e.g. geotechnical assessment and full-scale proof testing of floating roads);
- Changes to the site characteristics due to improved drainage and an increase in the strength of the peat under sustained dead load surcharges (i.e. the floating roads, peat repositories and material side cast areas); and
- Disposal of excavated material in designated repositories on the peat slopes where the peat stability had been assessed as having an adequate margin of safety, and in the borrow pits

These measures significantly reduced the likelihood of a peat slide for the remainder of the construction period and the operational phase of the project and there were no further peat slides as a consequence of the construction activities or operation activities. For the second phase of construction accounting for the mitigation that was put in place, the likelihood of a peat slide occurring at the wind farm site based on the peat stability risk assessment ranged from negligible to low (see Figure 10-35 in Chapter 10 : Likelihood (L) of a peat slide for mitigated site activities and improved site conditions at the end of construction in 2006). In accordance with the classification set out in Table 16-1 this has been assessed as **very unlikely to unlikely**.

Based on the peat stability risk assessment the likelihood of a peat slide occurring at the wind farm site for operation and maintenance activities in the period 2006 to mid 2020 remained negligible to low also (see, Figure -35 in Chapter 10). This is based on the reduction in the level of site activities, the improved drainage of the peat, the increase in peat strength beneath the sustained loadings of the floating roads and deposited material and the implementation of standard operating procedures on site which control the use of the site infrastructure.

For the remainder of the operation phase, mid-2020 to circa 2040 and decommissioning the likelihood of a peat slide is assessed as negligible to very low for the operational and maintenance period, (see Table 10-10 and Figure 10-36, Chapter 10). This has been proven by further load testing during the operation and maintenance phase of the project in 2019. There has been no peat slide as a consequence of the wind farm operation and maintenance activities on the wind farm site.

In accordance with the classification set out in Table 16-1 for the operation phase of the project in the period 2006 to mid-2020 the likelihood of this has been assessed as **very unlikely to unlikely**, and **unlikely** has been assumed for the assessment here.

In accordance with the classification set out in Table 16-1 for the operation phase of the project in the period mid-2020 to circa 2040 this has been assessed as **very unlikely** for the assessment here reflecting the reduced likelihood of peat failure for the remaining operational life of the wind farm.

Based on the peat stability risk assessment the likelihood of a peat slide occurring at the wind farm site for the decommissioning activities is negligible (Figure 10-37, Chapter 10). In accordance with the classification set out in Table 16-1 this has been assessed as **very unlikely**. This is mainly due to ongoing improved site conditions as a consequence of the drainage on the site and strength gain in the peat, as proven by site testing in 2019.

Vehicular accident on site roads: There was a risk of vehicular accidents on the wind farm during construction. Vehicular accidents did occur, such as readymix delivery lorry going of road and blade transporter going off road as described in Chapter 4 Population and Human Health and in accordance with the classification set out in Table 16-1 this has been assessed as **Likely**.

Given the extremely low numbers of vehicles on site during project operation vehicular accidents on site is not considered to be a significant risk during project operation. Traffic controls were in place and included one way traffic, speed restrictions, supervision of mobile cranes and road upgrade works. Despite this one mobile crane overturned in 2007 which was attributed to driver error. In accordance with the classification set out in Table 16-1 this has been assessed as **unlikely**.

Although decommissioning will involve less vehicles than project construction there is a risk of vehicular accidents on sites. In accordance with the classification set out in Table 16-1 this has been assessed as **unlikely**.

Aircraft collision: Derrybrien Wind Farm is located on the highest peak in the Slieve Aughty Mountains. The turbines are 76m above ground level and could present a collision hazard for small aircraft without mitigation.

It is noted that a helicopter collision occurred in the Slieve Aughty Mountains in July 2005 in conditions of poor visibility and low cloud cover, which resulted in two fatalities. The accident was an in-flight collision with terrain in dense forestry on the northern slopes of Slieve Aughty Mountains, outside the wind farm site.

The Air Accident Investigation Unit (AAIU) report in relation to the incident noted that the accident occurred in Class G airspace where helicopters should be flown above 150m, in an area clear of cloud and in a minimum flight visibility of 1000m.

The maximum height of the blades at Derrybrien is 76m above ground level. At the time of the accident virtually all of the turbines had been erected and half fitted with blade assemblies. The turbines were not struck by the helicopter.

The operational phase is the period most likely to be that when an aircraft collision would occur as all wind turbines would be fully erected and operational. This is the only period which is considered for the potential of a major accident or emergency to occur. Navigation lights have been fitted to a number of wind turbine generators, as agreed with the Irish Aviation Authority (IAA) and the geographic coordinates and elevations provided to the IAA also as a mitigation against potential collision.

In accordance with the classification set out in Table 16-1 the likelihood of a collision risk occurring during the operational and decommissioning phase has been assessed as **very unlikely.**

Substation/Turbine fires: Substation fires are rare occurrences and can occur during the operational phase due to a number of factors, including

- failures in energised electrical cables with combustible insulating material,
- water ingress to mineral oil insulated transformer equipment
- failure of core insulation to mineral oil insulated transformer equipment
- electrical arcing causing flammable gas to build up and possible explosion.
- Turbine fire as a result of loss of control or damage to turbine gearbox or blade causing overheating.

The substation and wind farm are subject to regular inspection and maintenance to minimise the risk of fires occurring and are also monitored remotely which allows for early detection of aberrant operation. In accordance with the classification set out in Table 16-1 this has been assessed as **unlikely.**

A substation fire or turbine fire occurring during construction and decommissioning when these are not operational will not occur from any of the factors listed above and such an incident has not been considered in the construction phase or decommissioning phase assessments.

Forestry/bog/gorse fires: Given the amount of vegetation (fuel) in the area there is a risk of fire on the site. The potential causes of fires are as follows:

- Weather conditions-prolonged dry weather and strong winds increase the risk of forestry/bog/gorse fires
- Weather conditions – lightning strikes
- Deliberate /accidental starting of forest/gorse fires
- Deliberate burning of vehicles-
- Spreading of substation or turbine fires (unlikely as fires usually contained inside turbines)

The risk of fire arising on Derrybrien site is mainly from fires spreading from adjoining lands. As such fires occasionally occur in the general area in accordance with the classification set out in Table 16-1 this has been assessed as **Likely** during the operational period but given the short construction and decommissioning periods would **not be likely** to occur during these periods and such an incident has not been considered for these phases.

Table of Risks: The identified risks for the construction phase, operational phase and decommissioning phase of the Project are presented in **Table 16-3**, **Table 16-4** and **Table 16-5** respectively.

Table 16-3: Construction Phase Hazards

Risk ID	Potential Hazard	Possible cause
Potential to cause accidents and / or disasters.		
A	Peat slide	Excessive loading of peat and/or poor drainage in an area of where the combination of the contributory factors results in a likely peat slide of scale
B	Vehicular accident on wind farm site roads	Failure to observe speed limit; human error

Table 16-4: Operational Phase Hazards

Risk ID	Potential Hazard	Possible cause
Potential to cause accidents and / or disasters.		
A	Peat slide	Excessive loading of peat slope and/or poor drainage in an area of where the combination of the contributory factors results in a likely peat slide of scale
B	Vehicular accident on wind farm site roads	Failure to observe speed limit; human error
C	Small aircraft hazard	Derrybrien Wind Farm is located on the highest peak in the Slieve Aughty Mountains. Poor visibility due to poor weather and low cloud cover could result in aircraft collision with turbines
D	Substation/Turbine Fire	Substation fires can occur due to a number of factors, including failures in energised electrical cables with combustible insulating material, water ingress or failure of core insulation to mineral oil insulated transformer equipment and electrical arcing causing flammable gas to build up and possible explosion. Loss of turbine control
Potential vulnerability to disaster risks		
E	Forestry / Bog / Gorse Fire	Extreme weather- strong winds, prolonged dry weather; spread of fire from adjacent Coillte forests and access tracks, deliberate setting on fire of vehicles on Coillte access track to site

Table 16-5: Decommissioning Phase Hazards

Risk ID	Potential Hazard	Possible cause
Potential to cause accidents and / or disasters.		
A	Peat slide	Excessive loading of peat and/or poor drainage in an area of where the combination of the contributory factors results in a likely peat slide of scale
B	Vehicular accident on site roads	Failure to observe speed limit; human error

Table 16-6:Hazards- Assessment of Impact and Likelihood

Ref	Hazard	Impact				Likelihood	Did hazard arise (Yes/No))
		Human Welfare	Environment	Infrastructure	Social		
Construction Phase 2003 – October 2003							
A (1)	Peat slide	Minor	Very serious Note*	Serious	Limited	Likely	Yes
B (1)	Vehicular accident on site roads	Minor	Minor	Minor	Minor	Likely	Yes
Construction Phase 2004 to March 2006							
A (2)	Peat slide	Minor	Serious	Minor	Limited	Very unlikely to unlikely	No
B (2)	Vehicular accident on site roads	Minor	Minor	Minor	Minor	Likely	Yes
Operational Phase							
A (1)	Peat slide	Minor	Very serious	Serious	Limited	Very unlikely to unlikely	No
B (1)	Vehicular accident on site roads	Minor	Minor	Minor	Minor	Unlikely	Yes
C	Small aircraft hazard	Serious	Limited	Limited	Limited	Unlikely	No

Ref	Hazard	Impact				Likelihood	Did hazard arise (Yes/No))
		Human Welfare	Environment	Infrastructure	Social		
D	Substation/Turbine Fire	Limited	Limited	limited	Limited	Unlikely	No
E	Forestry / Bog / Gorse Fire	Serious	Serious	Limited	Limited	Likely	Yes
Decommissioning Phase							
A	Peat slide	Minor	Very serious	Serious	Limited	Very Unlikely	__
B	Vehicular accident on site roads	Serious	Minor	Minor	Minor	Unlikely	__

Note*. The categorisation of impact on the environment is a combination of the impact on habitat, water quality and aquatic species and fisheries with impacts on fisheries being categorised as Serious to Very Serious resulting in an overall impact categorisation of Very Serious.

16.5.2 Construction Phase Impacts

The following section provides the assessment of the construction phase impacts in the context of Major Accidents. The impacts which are considered in this regard are the impact of a large peat slide, and vehicle accidents on the site access tracks.

Peat Slide:

Construction Phase 1 - 2003

A large peat slide occurred during the construction of the wind farm in October 2003 the causes and features of which are discussed in Sections 16.4.3.1 and 16.5.2 respectively. Prior to this event there were a number of more minor localised failures, as referred to above, on the wind farm site during the construction phase. These failures have also been attributed to construction activities and are discussed in detail in Chapter 10. These were relatively localised and did not extend beyond the site boundary. The October 2003 peat slide and its extents are described below.

At the time of the peat slide on the 16th October 2003 peat was being excavated from the site of Turbine T68 and placed on the intact peat slopes on the downslope side of the floating road, opposite the turbine, using 2 No. 20 tonne Hitachi EX200 long-reach excavators. The excavators were operating on the floating road and on a small section of granular hardstanding on the glacial till between the turbine site and the hardstanding. The excavation had not progressed into the glacial till so only peat was side cast on the slopes (see Plate 16-1 and Plate 16-2).

Plate 16-1 - Excavation at Turbine T68 at the time of the slide

Plate 16-2 – Aerial view of the head of the slide at Turbine T68 (October 2003)

Although the peat slide occurred while excavated material was being side cast on the intact peat slopes, site observations at the time of the slide indicated that the failed mass of peat initially moved as a rigid body in a very large planar slide over a wide area on the slopes of the mountain.

The peat slides displaced peat and forestry on the slopes over an area of 25Ha that extended 1.65km downslope from Turbine T68, which slide event is considered very large (>10Ha). The majority of this slide area (≈90%) was in the Coillte coniferous forests outside the windfarm site. Two wind farm access tracks and one forestry access track were removed by the slide.

The path of the peat slide debris followed a tributary stream valley (SC7b) of the Owendalulleegh River. From the source area, the peat slide debris passed down the tributary stream valley which narrows to form a steep-sided channel at about 250 m AOD before widening downslope above c.195 m AOD, which is the location of the Black Road Bridge.

Below the Black Road Bridge (c.195 m AOD), the tributary stream follows a more southerly course within forestry to the Flaggy Bridge. Below the Flaggy Bridge (c.150 m AOD) the stream meanders around a number of shallow relief landforms in the floor of the Owendalulleegh River valley and is joined by further tributary streams (SC7a and SC7c) before joining the Owendalulleegh River about 1.3 km south of local road R353 (location of Flaggy Bridge).

The presence of the peat slide debris is notably reduced beyond the confluence with the Owendalulleegh River and essentially there is no reported debris deposited on the riverbanks after about 1.2 km downstream of the confluence with the Owendalulleegh River. At this location the peat slide debris would have been entirely suspended within the river water.

The main road (Regional road R353) providing access to Derrybrien village from the east and the local road between Derrybrien village and Loughrea were blocked over a few days and two small road bridges were damaged. Based on anecdotal reports the R353 Regional road was closed for 5 days and the Black Rd for a period in the order of 2-3 weeks.

The damage caused to a number of bridge structures were repaired shortly afterwards.

The length of the peat debris path from the end of the source area (assuming at about 250 m AOD) to the point where the peat slide debris was entirely suspended within river water is estimated at 5.8 km. The peat slide debris basically consisted of material from the peat slide source area. The majority of the peat slide source area was outside of the wind farm site.

Construction Phase 2 – 2004 – 2006

There were no peat slides during the second phase of construction. This was mainly due to:

- Additional geotechnical investigations, stability analyses, testing, monitoring and geotechnical supervision during the construction stage of the project (e.g. geotechnical assessment and full-scale proof testing of floating roads);
- Changes to the site characteristics due to improved drainage and an increase in the strength of the peat under sustained dead load surcharges (i.e. the floating roads, peat repositories and material side cast areas); and
- Disposal of excavated material in designated repositories on the peat slopes where the peat stability had been assessed as having an adequate margin of safety, and in the borrow pits

These mitigation factors apply to the remainder of the project life as they had a significant impact on the risk associated with the construction and use of the floating infrastructure and the storage of material on site.

Vehicular accident on site roads

Recorded vehicular accidents which occurred on site roads are as follows:

- Concrete truck overturned on the site road in September 2003. Concrete removed and truck righted. No injuries recorded.
- Ready mix concrete lorry went off a site road due to human error which was regarded as a dangerous occurrence. No injuries recorded.
- one recorded incident on a site road during 2004, which was not a collision related incident. A contractor's drilling rig, which had just arrived on site to undertake geotechnical investigation, caught fire. This was quickly extinguished. The likely cause was dried peat material on the underside of the vehicle which had adhered to the drilling rig from a previous site. No injuries recorded

Vehicular accident on off-site roads: Vehicular accidents recorded on off-site roads were as follows:

- Blade transports trailer went off the "Black Road" in the early hours of Monday Morning 21st June at circa 1-2am. There were no injuries, but the transporter blocked the road for the morning period.
- During road resurfacing works in November 2005 on the Black road a Hamm HD70 (approx. 6Tonne) Tandem Roller vibrated itself off the road. The ground did not give way. No injuries were recorded and minor damage occurred to the roller which was recovered the next day.

16.5.2.1 Likelihood and Impacts-Life, Health and Welfare

Peat Slide_ Construction Phase 1 - 2003

There were no fatalities and no injuries requiring hospitalisation caused by the peat slide. No households were evacuated. The unoccupied (derelict) house downslope of the wind farm site was within the path of the peat slide debris and the peat slide

gave rise to accumulations of displaced peat around the property and over the private access road lands adjacent to the property.

The damage done to the public roads did not result in injury or death.

The potential for a peat slide of scale engulfing Derrybrien village during this period of the project is considered to be very remote considering that the area of the site which shares the sub-catchment with Derrybrien is very small in the context of the overall site.

Using the classification of likelihood in Table 16-1 and impact categorisation in Table 16-2 the peat slide is classed as **Likely** to occur and as a **Minor** impact in terms of life, health and welfare and the risk is assessed as **Low** for the construction phase 1 stage.

Peat Slide Construction Phase 2 – 2004 – 2006

With the implementation of detailed assessments and mitigation during the post slide construction period no further peat slides occurred. There were no fatalities and no injuries requiring hospitalisation

There was no damage to the public roads.

Th potential for a peat slide of scale engulfing Derrybrien village during this period of the project was significantly reduced with the implementation of the construction mitigation methods post slide and is also considered to be very remote considering that the area of the site which shares the sub-catchment with Derrybrien is very small in the context of the overall site.

Using the classification of likelihood in Table 16-1 and impact categorisation in Table 16-2 the peat slide is classed as **Very unlikely to likely** to occur and as a **Minor** impact in terms of life, health and welfare and the risk is assessed as **Low** for the construction phase 2.

Vehicular Accidents: Although a number of vehicular accidents occurred on site and also off-site there were no fatalities or hospitalisations from these incidents. Using the likelihood classification in Table 16-1 and the impact categorisation in Table 16-2 vehicular accidents are classed in the category **Likely** to occur but with **Minor** impacts in terms of life, health and welfare and the risk is assessed as L**ow** for both construction phase 1 and phase 2.

16.5.2.2 Likelihood and Impacts-Land and Terrestrial Habitats

Peat slide - Construction Phase 1 - 2003

The following section attempts to characterise the category of impact caused to the land and habitats by the October 2003 peat slide with reference to the definitions of impact rankings in the 2010 DOEHLG Guidelines.

The impact of the peat slide on land and habitats has been assessed in Chapter 10 Soils, Geology & Land and Chapter 7 Biodiversity of the rEIAR respectively. The impact of the peat slide on aquatic environment has been assessed in Chapter 8 of the rEIAR.

The peat slide displaced peat and forestry on the slopes over an area of circa 25ha that extended 1.65km downslope from Turbine T68, which is considered a very large peat slide event (>10Ha). The majority of the peat slide area (≈90%) was in the Coillte coniferous forests outside the windfarm site. From here fluidised remoulded peat from the slide entered the valley of the stream which rises in the townland of Derrybrien North and inundated farmland down to the Black Road Bridge approximately 1.0 km downslope from the slide area where rockfill barrages were constructed to contain debris material. This was the primary run-out zone for the slide. Remoulded peat was transported further downstream along the river channel.

Terrestrial habitats that were directly affected by the peat slide comprised conifer forestry (open canopy pre-thicket and mature closed canopy) and wet grassland used for agriculture (wet grassland).

The area of terrestrial habitat most affected by the peat slide occurred in the area between the wind farm site and the Flaggy Bridge.

Wind farm site and Flaggy Bridge: The loss and transport of peat leading to extensive disturbance of low value ecological habitat in this area was assessed as **Negative, direct, moderate impact of medium** term duration, affecting c. 25 ha of low value habitat. The impact is non-reversible although recovery of semi-natural habitat has occurred in the medium term. (Chapter 10., Section 10,7.4.2.Table 7.19 . This led to non-significant effects on the basis that the habitat affected was of low value and represented a relatively small area of conifer plantation that is common throughout the wider landscape. Since the peat slide event, the habitat has recovered and developed into a semi-natural mosaic of heath of scrub and vegetation.

Surveys undertaken along the peat slip areas in 2011 and 2018 have shown almost full recovery of vegetation and habitat structure throughout this area, (see Chapter 7, Terrestrial Biodiversity).

Flaggy Bridge to Lough Cutra: The deposition of peat throughout the section from Flaggy Bridge to Derrybrien East caused a moderate short-term negative impact on riparian habitats caused by scouring and smothering of vegetation. These areas recovered in a relatively short period with good vegetation cover dominated by grassland and scrub species observed in all areas in October 2005. The impact was relatively small in extent being restricted in the most part to the immediate banks of the river, the impact only extended into adjacent fields in those areas with low banks. The impact led to non-significant effects on the basis of relatively low ecological value habitats being impacted and the duration of the impact being short term.

Using the likelihood classification in Table 16-1 and impact categorisation in Table 16-2Error! Reference source not found. The likelihood of occurrence is classed as **Likely** and the impact of the peat slide on land and habitats has been assessed as

Serious because, although the land and habitats have largely recovered, the extent of land affected was very large but this was of low value habitat with non-significant effects. The risk is therefore assessed as **Medium** for Construction Phase 1.

Peat slide - Construction Phase 2 – 2004 – 2006

The likelihood of a peat slide significantly reduces for Construction Phase 2 to **Very Unlikely**- **Unlikely** as per Table 16-1 and no further peat slide occurred reflecting the effectiveness of the construction mitigation introduced. However, if it were to occur then the impact on habitats would be categorised as **Serious** as per Table 16-2 and the risk rating is **Medium**.

Vehicular Accidents Construction Phases 1 and 2:

Vehicular accidents mainly lead to a temporary impact on adjacent poor quality habitat with imperceptible effects during vehicle impact and recovery operations. The main impact occurred with the overturning of the concrete delivery vehicle. To facilitate concrete offloading and recovery of concrete a temporary pit was excavated adjacent to the site road. This would have led to a loss of a very small area of poor quality habitat. Vehicular accidents are classed as **Likely** as per Table 16-1 and in accordance with the impact categorisation in Table 16-2 the impact is categorised as **Minor** on land and habitats with the risk identified as **Low** as per Figure 16-1.

16.5.2.3 Likelihood and Impacts-Freshwater Quality and Fisheries

Peat slide Construction Phase 1 - 2003

The following section attempts to characterise the category of emergency caused to the environment by the October 2003 Derrybrien Wind Farm peat slide with reference to the definitions of rankings in the 2010 DOEHLG Guidelines.

The impacts of the 2003 peat slide on the freshwater habitats of the Owendalulleegh River and Lough Cutra have been assessed in detail in Chapter 8 of the EIS. This assessment was based on available biological and water chemistry data at the time and subsequently, combined with anecdotal reports at the time. Recovery from the event was assessed based on data collected subsequently on fisheries, biological water quality and water chemistry.

Table 5.2 of the Guidance Document notes that the impact occurring is referred to as contamination. This is a very broad term and in an Irish context could refer to toxic and persistent materials such as pesticides, toxic and less persistent materials such as hydrocarbons, highly corrosive materials such as strong acids and bases and in the same category cement. There are also non-toxic substances such as silage liquor, slurry or raw milk, which although non-toxic have a very high oxygen demand which if satisfied can give rise to anoxic conditions in receiving waters. The peat material which arose from the Derrybrien slide doesn't fit into any of these categories.

It is not toxic; it is not persistent in the chemical sense and can best be described as inert solids. The key characteristic of the peat was its very large volume and large suspended solids content which is reported to have had a mechanical impact on some habitats and a smothering effect on fish and invertebrates. The mechanical effects appear to have been largely confined to the small side stream into which the liquidised peat from the slide flowed and to a much lesser extent for the first 1 to 2 km downstream of the confluence of this stream with the main channel. The mechanical effects in the side stream consisted of scouring of bed material along the stream bed, heavy deposition of peat and woody debris along the banks and the edges of the channel margins, accompanied by what is likely to have been a near total removal of fish and invertebrates. As the gradient dropped rapidly below the confluence with the main channel the scouring effect of the flow was greatly reduced and the mechanical effects i.e. turning of boulders and scouring of in-channel plants gradually diminished.

In the 2-3 weeks after the slide the EPA noted that in the upper reaches of the main channel of the Owendalulleegh that there was a very sharp drop in water quality as gauged using the Q-value biotic index, based on invertebrate collections. The EPA carried out Q-value surveys at 5 points in the middle and lower reaches of the main river on November 17th, 2003 (see Chapter 8, Section 8.3.2.2). They noted that the upper 5 km section of the river was effectively wiped out in terms of aquatic invertebrate stream life, while the impact on the lower section was "*not as bad as might have been feared initially*". At the final EPA monitoring site, 1.5 km upstream of Lough Cutra (i.e. some 22 km downstream from the peat slide) the author noted that the impact of the peat slide was "*surprisingly low"* and also noted "*that mid-stream kick sampling did not raise peat silt. Deposits of fine peat silt were again noted in the riparian zone and some light-coloured, grass-like plant debris was present among the stones, but the amount of larger woody debris was less than at the upstream sites"*.

This effect saw a drop from High Status to Bad Status at the most upstream site declining with distance to a smaller drop in quality from High to Good status at the last site 1.5km upstream of Lough Cutra. At the same time in the outlet river from Lough Cutra (Beagh River) there was no decline in Q-rating observed, i.e. it was Good Status having also been Good Status when previously surveyed in 2000. Given that these surveys were undertaken just one month after the peat slide, they can be said to have been representative of conditions at the time. Three years later, all bar one site on the Owendalulleegh had returned to High Status, a single site remaining as Good Status. This would indicate that the system, in terms of macroinvertebrate water quality, had effectively fully recovered within that 3-year period.

The Shannon Regional Fisheries Board (ShRFB) estimated at the time that the peat slide resulted in at least 50,000 dead fish. It isn't clear how this figure was arrived at in the absence of quantitative baseline data for the river before the slide and because a systematic count wasn't undertaken at the time of the slide. Fish from six species are known to have been killed including brown trout, stone loach, eel, lamprey, perch and gudgeon. Subsequent surveys undertaken by ASU and Inis Environmental consultants would suggest that brown trout and stone loach are likely to have been

the most numerous fish impacted, especially in the middle and upper reaches of the main channel. In a spot electrofishing survey taken some time after the event by ShRFB personnel, small numbers of trout were encountered, which would suggest that there hadn't been a total wipe out of fish along the main channel at the time. Indeed, the EPA survey of November 17th 2003 noted there was no peat silt raised in the centre of the channel during kick sampling. This would suggest that the amounts of peat silt reaching the lower reaches were much lower than upstream and that some fish did survive the slide lower down in the system. This is further supported by suspended solids data from Galway County Council for November 1st 2003 which measured 1,410 mg/l of suspended solids at Flaggy Bridge in the impacted tributary and just 44mg/l suspended solids at the EPA sampling site at Killafeen Bridge. In any case it is clear that a very large fish kill did occur.

After the slide, fish, mainly trout, stone loach and lamprey, from un-impacted tributaries, but especially from the main channel upstream of the confluence of the impacted side stream would have begun to spawn in the impacted reaches with increasing hatching success as the peat was winnowed out of the gravels in subsequent floods. Indeed, the reduced competition for food and spawning caused by the kill probably improved the rate of fish recruitment, at least after the first year or so, when much of the deposited peat would have been washed out. The first systematic fish surveys in the river after the 2003 event were undertaken by Inland Fisheries Ireland in 2009, 2013 and 2016. These show very similar size distributions of trout in each year which suggests that the fish population structure had largely recovered within 6 years and possibly sooner. The same is likely to be true of stone loach. Lamprey, which has a more extended life cycle, with 5-6 years as ammocoetes, may have required a more extended period to fully recover. However, the presence of more sand in the system due to the slide combined with some deposited peat may have increased the availability of suitable habitats for the species along the margins of the main channel. Eel which only spawn at sea would rely on immigration through the underground river system to recolonise the Owendalulleegh.

The likelihood of occurrence is classed as **Likely** in Table 16-1 and using the impact categorisation in Table 16-2 the peat slide event can be categorised **as Limited to Serious** in terms of invertebrate water quality and general water quality impacts and **Serious to Very Serious** in terms of fisheries impacts. The risk therefore, as per Figure 16-1 is assessed as **High**.

Peat Slide Construction Phase 2 – 2004 – 2006

The likelihood of a peat slide occurring significantly reduces for Construction Phase 2 to **Very unlikely** to **Unlikely,** Table 16-1 but if it were to occur would be **Serious to Very Serious,** Table 16-2 and therefore the risk rating is **Medium**.

Vehicular accident (Construction Phase 1 and 2)

The concrete from the overturned concrete lorry was contained in a purpose built excavated area with blocked drainage and was removed from the location. There would have been minor impact on the surface water drains but this would not have impacted on the main receiving waters in the general area.

Vehicular accidents have occurred on site during construction and the Likelihood is classed as **Likely** for the pre and post slide construction phases in accordance with Table 16-1. The impact of a vehicle accident in both construction phases is categorised as **Minor** as per Table 16-2 and vehicular accident events are assessed as **Low risk** for both construction phases as per Figure 16-1**.**

16.5.2.4 Likelihood and Impacts -Cultural Heritage

As stated in Section 16.4.2 above no cultural heritage was identified within the site or its surrounding area that could be impacted and no impact occurred from either the peat slide or vehicular accidents.

16.5.2.5 Likelihood and Impact on Infrastructure

Peat Slide Construction Phase 1 - 2003

Roads: The main road (Regional road R353) providing access to Derrybrien village from the east and the local road between Derrybrien village and Loughrea was blocked over a few days and two small road bridges were damaged. Based on anecdotal reports the R353 Regional road was closed for 5 days and the Black Rd for a period in the order of 2-3 weeks. This resulted in road users:

- accessing Derrybrien village from the east (when the R353 closed) being required to take detours depending on route taken of approximately 41-53km each way as opposed to 13km (from Drumkeery crossroads) during the period.
- accessing Loughrea from Derrybrien village when the Black Rd was closed being required to take detours depending on route taken of approximately 23-36km each way as opposed to 18km during the period.

Water Supplies: There was no interruption of the water supply from the Gort Regional Water Supply Scheme. Nor were there any interruptions of electricity, gas or telephone services.

Economic Costs: The peat slide gave rise to costs of just over €3 million which related to works to bridges and roads undertaken in the aftermath of the peat slide as detailed throughout the rEIAR and insurance payments to owners of private land. This excludes the project delay costs and the installation of the barrages and peat repositories.

The likelihood of the peat slide is classed as **Likely** in Table 16-1 and categorised as a **Serious** impact in terms of infrastructure in terms of impact in Table 16-2 therefore risk rating is assessed as **Medium** for Construction Phase 1.

Peat Slide Construction Phase 2- 2004-2006

The likelihood of a peat slide significantly reduces for Construction Phase 2 to **Very unlikely** to **Unlikely**, Table 16-1 with the categorisation of Impact remaining **Serious** and therefore the risk rating is also assessed as **Medium**.

Vehicular accidents (Construction Phases 1 and 2)

Roads: The Black Road was blocked as a result of a wind turbine blade delivery vehicle for a period of circa 10 hours. This would have caused minor inconvenience to local road users.

Water supplied: No impact

Economic Cost: The economic cost due to lost construction time and limited vehicle damage from accidents would have been less than € 0.5 Million.

The likelihood of a vehicle accident occurring during both construction phases Is classed as **Likely** as per Table 16-1 with known accidents actually occurring and the impact categorisation of such accidents is categorised as **Minor** using the impact categorisation in Table 16-2 therefore the risk rating is assessed as **Low**.

16.5.2.6 Likelihood and Impact - Social

Peat Slide Construction Phase 1 - 2003

While the peat slide had a temporary negative impact on the local community requiring road detours for road users for a number of weeks, it did not result in the serious disruption of the functioning of the community or society.

The likelihood of the event occurring is classed as **Likely** as per Table 16-1and using the impact categorisation in Table 16-2 the peat slide is categorised as having had **Limited** social impacts and therefore the risk rating is assessed as **medium**.

Peat Slide Construction Phase 2 – 2004-2006

The likelihood of a peat slide significantly reduces for Construction Phase 2 to **Very unlikely to Unlikely** as per Table 16-1 and the impact categorisation remains **Limited** as per Table 16-2 were it to occur therefore the risk rating is assessed as **Low**.

Vehicular accidents (Construction Phase 1 and 2)

Vehicular accidents occurred during construction and would have given rise to short term disruption of the local traffic network if they occurred off-site causing a minor social effect.

Vehicular accidents are classed as **Likely** to occur as per Table 16-1 and using the impact categorisation in Table 16-2 are categorised as **Minor** social impacts and therefore the risk rating is **Low**.

16.5.2.7 Summary of likelihood and impacts during the construction phase

A summary of the likelihood of occurrence, scale of impact and risk rating for each parameter assessed for both a peat slide event and a vehicular collision is provided for Construction Phase 1 in Table 16-7and for Construction Phase 2 in Table 16-8.

Table 16-7: Summary of Likelihood, Impact and Risk for Construction Phase 1

	Peat Slide (A1)			Vehicular Accident (B1)		
Parameter	**Likelihood**	**Impact Scale**	**Risk Level**	**Likelihood**	**Impact Scale**	**Risk Level**
Life, health and Welfare	Likely	Minor	Low	Likely	Minor	Low
Environment Habitats	Likely	Serious	Medium	Likely	Minor	Low
Environment Water Quality and Fisheries	Likely	Serious - Very Serious	High	Likely	Minor	Low
Infrastructure	Likely	Serious	Medium	Likely	Minor	Low
Social	Likely	Limited	Medium	Likely	Minor	Low

Table 16-8: Summary of Likelihood, Impact and Risk for Construction Phase 2

Parameter	**Peat Slide (A2)**			**Vehicular Accident (B2)**		
	Likelihood	**Impact Scale**	**Risk Level**	**Likelihood**	**Impact Scale**	**Risk Level**
Life, health and Welfare	Very Unlikely - Unlikely	Minor	Low	Likely	Minor	Low
Environment Habitats	Very Unlikely - Unlikely	Serious	Medium	Likely	Minor	Low
Environment Water Quality and Fisheries	Very Unlikely - Unlikely	Serious - Very Serious	Medium	Likely	Minor	Low
Infrastructure	Very Unlikely - Unlikely	Serious	Medium	Likely	Minor	Low
Social	Very Unlikely - Unlikely	Limited	Low	Likely	Minor	Low

During the Construction phase 1 in 2003 a peat slide event is classed as **Likely** to occur with **Serious to Very Serious** impacts on fisheries, **Serious** impacts on habitats and infrastructure, **Limited** impacts on social aspects and **Minor** impacts on life , health and welfare. The highest risk rating during the Construction phase in 2003 due to a peat slide event is **High.** A vehicular traffic incident is classed as Likely to occur with Minor impacts and a risk rating overall of **Low.**

During the subsequent construction phase 2 between 2004 and 2006 a peat slide event is classed as **Very Unlikely to Unlikely** to occur but with **Serious to Very Serious** impacts on fisheries, **Serious** impacts on habitats and infrastructure, **Limited** impacts on social aspects and **Minor** impacts on life , health and welfare. The highest risk rating during the Construction phase in 2003 due to a peat slide

event is **Medium.** A vehicular traffic incident is classed as Likely to occur with Minor impacts and a risk rating overall of **Low.**

16.5.2.8 Overall Risk Rating-Construction Phase

A summary table of the risk categories identified for each aspect assessed in Sections 16.5.2.1 to 16.5.2.6 is presented in

Table **16-9**. The overall risk level is assigned the highest risk rating of all parameters assessed.

Table 16-9: Summary Construction Phase Risk Category Assessments

	Peat Slide Construction Phase 1	Peat Slide Construction Phase 2	Vehicle Accidents Construction Phase 1	Vehicle Accidents Construction Phase 2
Parameter	**A1**	**A2**	**B1**	**B2**
Life, Health and Welfare	Low	Low	Low	Low
Environment: Habitats	Medium	Medium	Low	Low
Environment: Water Quality and Fisheries	High	Medium	Low	Low
Infrastructure	Medium	Medium	Low	Low
Social	Medium	Low	Low	Low
Overall Risk level	High	Medium	Low	Low

The risk matrix for the construction phase 1 key hazards is presented in Figure 16-4: Risk Matrix -Construction Phase 1. Letters representing Hazards are as per Section 16.5.1 with "A" denoting the peat slide and "B" denoting vehicular accident, C denoting small aircraft collision, D denoting substation or wind turbine fire and E denoting a forest, bog or gorse fire'.

Figure 16-4: Risk Matrix -Construction Phase 1

Likelihood	Very Likely	5					
	Likely	4			E		
	Unlikely	3	B	C, D	A		
	Very unlikely	2					
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5

The risk matrix for the construction phase 2 critical hazards is presented in Figure 16-5. Letters representing Hazards are as per Section 16.5.1 with "A2" denoting the peat slide and "B2" denoting vehicular accident.

Figure 16-5: Risk Matrix -Construction Phase 2

Likelihood	Very Likely	5					
	Likely	4			B2		
	Unlikely	3				A2	
	Very unlikely	2					
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5
			Consequences				

16.5.3 Operational Phase Impacts

The following section provides the assessment of the operation phase impacts in the context of Major Accidents with respect to the Project (windfarm and grid connection). The impacts which are considered in this regard are the impact of a large peat slide, vehicle accident, gorse fire(s) and aircraft collision. The hazards identified during the operational phase of the wind farm project are all considered to be unlikely.

Peat Slide: The wind farm activities have not resulted in any peat slides for the operation and maintenance phase to the end of Q2 2020. Furthermore, for the remaining period of the operation phase (to c. 2040) of the project no further peat slides are expected, in fact it is anticipated that the likelihood of a peat slide will continue to reduce due to the drainage improvement and sustained loading of the peat from the constructed infrastructure and resulting increase in peat strength. The probability is therefore **very unlikely - unlikely**.

Vehicular Accidents: During the operational phase from 2006 to mid-2020 a mobile crane went off a site road due to human error which was regarded as a dangerous occurrence. No injuries were recorded. Given the infrequent nature of the occurrence the probability has been assessed as **unlikely**.

Aircraft Collision: There has been no aircraft collision with the wind turbines. As stated in Chapter 2 aviation lights are provided on nine turbines, specifically T1, T18, T26, T44, T46, T47, T52, T61 and T65 to clearly mark the wind farm hazard. The

Irish Aviation Authority has also been provided with the geographic coordinates of all turbines on the site. The probability of an aircraft collision is **very unlikely**.

Substation/Wind turbine fire: There has been no fire at the wind farm or Agannygal substation to date and no fire has occurred on a wind turbine on site either. Routine maintenance is carried out regularly on the wind farm turbines and on the substations and these are also remotely monitored. It is **unlikely** that either a substation or wind turbine generator fire will occur.

Gorse Fire: A gorse fire encroached onto a small area (approximately 50m^2) of unplanted ground to the north east of the wind farm site and came within approximately 40m of Turbine 44 in late April 2015. It is understood that scrub was being burned off a few kilometres away on unplanted land on the west side of the Black Road which got out of control, crossed over the Black Road and encroached onto the wind farm site.

Given the threat to forestry, Coillte organised a response which involved the Fire Brigade, Coillte staff and a helicopter response. The wind farm also activated its own response plan at the time. The fire on the wind farm site was put out over a 5/6hour period. Given that gorse fires have been recorded in the general area a similar fire is **likely** to occur in the operational period.

16.5.3.1 Likelihood and Impacts-Life, Health and Welfare

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential for a peat slide of scale to engulf Derrybrien village is considered to be very remote considering that the area of the site which shares the sub-catchment with Derrybrien is very small in the context of the overall site. The impact categorisation in Table 16-2 the impact is assessed as **Minor** and the risk is assessed as **Low**.

Vehicular Accidents: The probability of a vehicular accident occurring during the operational period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) hence the risk is rated as **Low**.

Aircraft collision: The probability of an aircraft collision with the wind farm is classed as **Unlikely** as per Table 16-1. However, should there be a small aircraft collision with the turbines this could lead to fatalities occurring and a **Serious** impact as identified in Table 16-2 impact categorisation. The risk is therefore assessed as **medium** for the operation phase.

Substation/wind turbine fires: The probability of a substation or turbine fire occurring on site is **Unlikely** (Table 16-1) and no substation or turbine fire has occurred since operations began. Should a fire occur on the site, there is a risk that this would lead injury and a possible fatality . The impact has been categorised as **Limited** using the impact categorisation in Table 16-2. The risk is assessed as **Low** for the operation phase,

Forestry/bog/gorse fires: The probability of a forest gorse or bog fire occurring is classed as **Likely.** As noted above, in 2015 a gorse fire did occur during the

operational period which encroached on the wind farm site. Should a forest/gorse fire occur on the site, there is a risk that this would lead to injury and possible fatalities occurring and a **Serious** impact category has been assigned based on Table 16-2. The risk is assessed as **medium** for the operation phase.

16.5.3.2 Likelihood and Impacts-Land and Terrestrial Habitat

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential impact was a peat slide of scale to occur is assessed as **Serious** based on the impact categorisation in Table 16-2. The risk is assessed as **medium** for the operation phase.

Vehicular Accident: A vehicular accident probability is classed as **Unlikely** as per Table 16-1and the impact were it to occur would be very localised and **Minor** as per Table 16-2. The risk is assessed as **Low**.

Aircraft collision: The probability of an aircraft collision with the wind farm is classed as **Unlikely** as per Table 16-1 and if such a collision occurred it would result in localised effects only leading to a **Minor** impact as described in Table 16-2 impact categorisation. The risk is assessed as **Low** for the operation phase.

Substation/wind turbine fires: The probability of a substation or turbine fire occurring on site is **Unlikely** (Table 16-1) and no substation or turbine fire has occurred since operations began. Should a substation or wind turbine fire occur on the site, it would likely be confined to the substation compound and wind turbine structure and would have limited impact on land or habitats. Based on the impact categorisation in Table 16-2. The risk is assessed as **Low** for the operation phase.

Forestry/bog/gorse fires: The likelihood of a forest/bog/gorse fire occurring is classed as Likely based on the site and area history as per Table 16-1 and should a fire occur on the site, this could damage either cutover bog or forestry habitat. This could lead to a **Serious** impact based on the ranking of impacts in Table 16-2 impact categorisation. The risk is assessed as **Medium** for the operation phase.

16.5.3.3 Likelihood and Impacts-Water Quality and Fisheries

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Serious** on water quality as it would contaminate water courses which impact would take several years to recover from and **Very serious** with respect to fisheries as it would likely take longer to recover fish stocks based on the ranking of impacts in Table 16-2. The risk is assessed as **Medium** for the operation phase.

Vehicular accident: The probability of a vehicular accident occurring during the operational period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact only of short duration, hence the risk is rated as **Low.**

Aircraft collision: The probability of an aircraft collision with the wind farm is classed as **Unlikely** as per Table 16-1. However, should there be a small aircraft collision

with the turbines this would give to localised impacts only of short duration and a **Minor** impact as identified in Table 16-2 impact categorisation. The risk is therefore assessed as **Low** for the operation phase.

Substation/wind turbine fires: The probability of a substation or turbine fire occurring on site is **Unlikely** (Table 16-1) and no substation or turbine fire has occurred since operations began. Should a substation or wind turbine fire occur on the site, it would likely be confined to the substation compound and wind turbine structure, but firefighting could give rise to local contamination with a limited impact on water quality and fisheries. Based on the impact categorisation in Table 16-2. The risk is assessed as **Low** for the operation phase.

Forestry/bog/gorse fires: The likelihood of a forest/bog/gorse fire occurring is classed as **Likely** based on the site and area history as per Table 16-1 and should a fire occur on the site, this could give rise to an increase in sediment entrained runoff which would flush through the river system after the initial few storm events. The impacts would be short term and have a **Limited** impact based on the impact categorisation in Table 16-2. The risk is assessed as **Medium** for the operation phase.

16.5.3.4 Likelihood and Impacts -Cultural Heritage

As stated in Section 16.4.2 above no cultural heritage was identified within the site or its surrounding area that could be impacted and no impact would occur from the hazards identified.

16.5.3.5 Likelihood and Impact on Infrastructure

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Serious** based on the ranking in Table 16-2 as it would likely give rise to damage in excess of 3 million euros. The risk is assessed as **Medium** for the operation phase.

Vehicular Accident: The probability of a vehicular accident occurring during the operational period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact on infrastructure only of short duration, hence the risk is rated as **Low.**

Aircraft collision: The probability of an aircraft collision with the wind farm is classed as **Unlikely** as per Table 16-1. However, should there be a small aircraft collision with the turbines this would give to damage to infrastructure on the wind farm likely up to 3 Million euros which is categorised as a **Limited** impact as identified in Table 16-2 impact categorisation. The risk is therefore assessed as **Low** for the operation phase.

Substation/wind turbine fires: The probability of a substation or turbine fire occurring on site is **Unlikely** (Table 16-1) and no substation or turbine fire has occurred since operations began. Should a substation or wind turbine fire occur on the site, it would likely result in damage to the wind farm or grid connection infrastructure and not to any external infrastructure as identified in Section 16.4.5 above. The cost of damage is likely to be less than 3 million Euro which is categorised

as a **Limited** impact based on the impact categorisation in Table 16-2 and the risk is assessed as **Low** for the operation phase.

Forestry/bog/gorse fires: The likelihood of a forest/bog/gorse fire occurring is classed as **Likely** based on the site and area history as per Table 16-1 and should a fire occur on the site it would likely result in damage to the wind farm or grid connection infrastructure and not to any external infrastructure. The impacts would be short term and have a **Limited** impact based on the impact categorisation in Table 16-2. The risk is assessed as **Medium** for the operation phase.

16.5.3.6 Likelihood and Impacts Social

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Limited** using the impact categorisation in Table 16-2 and the risk is assessed as **Low** for the operation phase.

Vehicular Accident: The probability of a vehicular accident occurring during the operational period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact of short duration, hence the risk is rated as **Low.**

Aircraft collision: The probability of an aircraft collision with the wind farm is classed as **Unlikely** as per Table 16-1. However, should there be a small aircraft collision with the turbines this would give to potential injury and possible fatalities and would be categorised as **Limited** as identified in Table 16-2 impact categorisation. The risk is therefore assessed as **Low** for the operation phase.

Substation/wind turbine fires: The probability of a substation or turbine fire occurring on site is **Unlikely** (Table 16-1) and no substation or turbine fire has occurred since operations began. Should a substation or wind turbine fire occur it could result in injury or a fatality which is categorised as a **Limited** impact based on the impact categorisation in Table 16-2. The risk is assessed as **Low** for the operation phase.

Forestry/bog/gorse fires: The likelihood of a forest/bog/gorse fire occurring is classed as **Likely** based on the site and area history as per Table 16-1 and should a fire occur on the site it could result in injury or a fatality which is categorised as a **Limited** impact based on the impact categorisation in Table 16-2. The risk is assessed as **Medium** for the operation phase.

16.5.3.7 Summary of likelihood and impacts operational phase

A summary of the likelihood of occurrence, scale of impact and risk rating for each parameter assessed for the operational phase is provided in Table 16-10 below and summarised as follows:.

During the operational phase a peat slide event is classed as **Very unlikely to Unlikely** to occur with **Very Serious** impacts on fisheries, **Serious** impacts on habitats and infrastructure, **Limited** impacts on social aspects and **Minor** impacts on

life, health and welfare were a slide to occur. The highest risk rating during the operational phase due to a peat slide event is **Medium.**

A vehicular traffic incident is classed as **Unlikely** to occur with Minor impacts and a risk rating overall of **Low.**

An aircraft collision is classed as **unlikely** to occur but would give rise to **Minor** impacts on environment and **Limited** impacts on Life, health and Welfare, Infrastructure and Social aspects.

A substation or wind turbine fire is classed as **Unlikely** to occur but if it occurred the impact is ranked as **Limited** for all parameters.

A forest/bog/gorse fire is classed as **Likely** to occur and in all cases would give rise to a **Medium** impact.

Table 16-10: Summary of Likelihood, Impact and Risk for Operational Phase

Parameter	Peat Slide (A)			Vehicular Accident(B)			Aircraft Collision (C)			Substation Turbine Fire (D)			Forest/Bog/Gorse Fire (E)		
	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level
Life, Health and Welfare	Very Unlikely - Unlikely	Minor	Low	Unlikely	Minor	Low	Unlikely	Limited	Low	Unlikely	Limited	Low	Likely	Serious	Medium
Environment Habitats	Very Unlikely - Unlikely	Serious	Medium	Unlikely	Minor	Low	Unlikely	Minor	Low	Unlikely	Limited	Low	Likely	Serious	Medium
Environment Water Quality and Fisheries	Very Unlikely - Unlikely	Serious	Medium	Unlikely	Minor	Low	Unlikely	Minor	Low	Unlikely	Limited	Low	Likely	Limited	Medium
Infrastructure	Very Unlikely - Unlikely	Serious	Medium	Unlikely	Minor	Low	Unlikely	Limited	Low	Unlikely	Limited	Low	Likely	Limited	Medium
Social	Very Unlikely - Unlikely	Limited	Low	Unlikely	Minor	Low	Unlikely	Limited	Low	Unlikely	Limited	Low	Likely	Limited	Medium

16.5.3.8 Overall Risk Rating-Operational Phase

A summary table of the risk categories identified for each aspect assessed in Sections 16.5.3.1 to 16.5.3.6 is presented in Table 16-11. The overall risk level is assigned the highest risk rating of all parameters assessed.

Table 16-11: Summary Construction Phase Risk Category Assessments

Parameter	Peat Slide	Vehicle Accidents	Small Aircraft hazard	Substation/ Turbine Fire	Forest/Bog/ Gorse Fire
	A	B	C	D	E
Life, health and Welfare	Low	Low	Low	Low	Medium
Environment Habitats	Medium	Low	Low	Low	Medium
Environment Water Quality and Fisheries	Medium	Low	Low	Low	Medium
Infrastructure	Medium	Low	Low	Low	Medium
Social	Low	Low	Low	Low	Medium
Overall Risk level	**Medium**	**Low**	**Low**	**Low**	**Medium**

During the Operational phase the highest risk rating is ranked as Medium associated both with a potential peat slide or forest/bog/gorse fire**.** The risk rating due to a vehicular accident, small aircraft collision or substation/turbine fire is ranked overall as **Low.**

The risk matrix for the operational phase hazards is presented in Figure 16-6: Risk Matrix -Operational Phase

. Letters representing Hazards are as per Section 16.5.1. with “A1” denoting the peat slide, “C” denoting the Aircraft collision, “D” denoting the substation/turbine fire and “E” denoting the forestry, gorse or bog fire.

Figure 16-6: Risk Matrix -Operational Phase

Likelihood	Very Likely	5					
	Likely	4			E		
	Unlikely	3	B	D	C,	A	
	Very unlikely	2					
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5
			Consequences				

16.5.4 Decommissioning Phase Impacts

The following section provides the assessment of the decommissioning phase impacts in the context of Major Accidents with respect to the wind farm itself and the grid connection (overhead line and substation).. The impacts which are considered in this regard are the impacts of a large peat slide, vehicle collision and aircraft collision. The likelihood of the hazards identified during the decommissioning phase of the wind farm project are all considered to range between very unlikely to unlikely.

Peat Slide: The wind farm activities for the decommissioning phase are not expected to result in any further peat slides. This is due to the current improved site conditions and that for the remaining period of the operation phase (to c. 2040) it is anticipated that the likelihood of a peat slide will continue to reduce due to the drainage improvement and sustained loading of the peat from the constructed infrastructure and resulting increase in peat strength. The likelihood of a peat slide during decommissioning is considered to be **very unlikely**.

Vehicular accidents: It is expected that the number of vehicles on site during decommissioning will be lower than during the construction phase. There would still be a possibility of accidents occurring, but the probability would be less and considered **unlikely** to occur.

Aircraft Collision:. There is a risk of a small aircraft collision with the wind farm during decommissioning, but this will reduce as decommissioning advances with the removal of all surface structures. However, this is considered to be **very unlikely**.

Substation/Turbine Fire: During decommissioning the wind turbines will be dismantled and will not produce electricity. The probability of a fire occurring will be **very unlikely**.

Forest/Bog/Gorse Fire: The probability of a forest , bog or gorse fire occurring and impacting the wind farm in the short decommissioning time period would always exist but would be rated as **unlikely** to occur.

16.5.4.1 Likelihood and Impacts-Life, Health and Welfare

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **Very unlikely** as per Table 16-1. The potential for a peat slide of scale to engulf Derrybrien village is considered to be very remote considering that the area of the site which shares the sub-catchment with Derrybrien is very small in the context of the overall site and based on the impact categorisation in Table 16-2 it has been categorised as **Minor** and the risk is assessed as **Low**.

Vehicular Accident: A vehicular accident probability is classed as **Unlikely** as per Table 16-1 and the impact were it to occur would be very localised and **Minor** as per Table 16-2. The risk is assessed as **Low**

16.5.4.2 Likelihood and Impacts-Land and Terrestrial Habitat

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **Unlikely**. The impact of a peat slide, were it to occur is categorised as **Serious** based

on the impact categorisation in Table 16-2. The risk is assessed as **medium** for the decommissioning phase.

Vehicle collision: A vehicular accident probability is classed as **Unlikely** as per Table 16-1 and the impact were it to occur would be very localised and **Minor** as per Table 16-2. The risk is assessed as **Low**.

16.5.4.3 Likelihood and Impacts-Water Quality and Fisheries

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Serious** on water quality as it would contaminate water courses which impact would take several years to recover from and **Very serious** with respect to fisheries as it would likely take longer to recover fish stocks based on the ranking of impacts in Table 16-2. The risk is assessed as **Medium** for the decommissioning phase.

Vehicle collision: The probability of a vehicular accident occurring during the operational period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact only of short duration. Hence the risk is rated as **Low.**

16.5.4.4 Likelihood and Impacts -Cultural Heritage

As stated in Section 16.4.2 above no cultural heritage was identified within the site or its surrounding area that could be impacted and no impact would occur from the hazards identified

16.5.4.5 Likelihood and Impact on Infrastructure

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Serious** based on the ranking in Table 16-2 as it would likely give rise to damage in excess of 3 million euros. The risk is assessed as **Medium** for the decommissioning phase.

Vehicular Accident: The probability of a vehicular accident occurring during the decommissioning period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact on infrastructure only of short duration, hence the risk is rated as **Low.**

16.5.4.6 Likelihood and Impacts - Social

Peat Slide: The likelihood of a peat slide occurring for this phase is considered to be **very unlikely to unlikely** as per Table 16-1. The potential impact were a peat slide of scale to occur is assessed as **Limited** using the impact categorisation in Table 16-2 and the risk is assessed as **Low** for the decommissioning phase.

Vehicular Accident: The probability of a vehicular accident occurring during the decommissioning period is classed as **Unlikely** (Table 16-1) and the impact if it were to occur is categorised as **Minor** (Table 16-2) as it would give rise to a very localised impact of short duration, hence the risk is rated as **Low.**

16.5.4.7 Summary of likelihood and impacts operational phase

A summary of the likelihood of occurrence, scale of impact and risk rating for each parameter assessed for the decommissioning phase is provided in Table 16-12 below and summarised as follows:.

During the decommissioning phase a peat slide event is classed as **Very unlikely** to occur with potentially Very Serious impacts on fisheries, **Serious** impacts on habitats and infrastructure, **Limited** impacts on social aspects and **Minor** impacts on life , health and welfare were a peat slide to occur. The highest risk rating during the operational phase due to a peat slide event is **Medium.**

A vehicular traffic incident is classed as **Unlikely** to occur with Minor impacts and a risk rating overall of **Low.**

Table 16-12: Summary of Likelihood, Impact and Risk Decommissioning Phase

Parameter	Peat Slide (A)			Vehicular Accident (B)		
	Likelihood	Impact Scale	Risk Level	Likelihood	Impact Scale	Risk Level
Life, health and Welfare	Very unlikely	Minor	Low	Unlikely	Minor	Low
Environment Habitats	Very unlikely	Serious	Medium	Unlikely	Minor	Low
Environment Water Quality and Fisheries	Very unlikely	Very Serious	Medium	Unlikely	Minor	Low
Infrastructure	Very unlikely	Serious	Medium	Unlikely	Minor	Low
Social	Very unlikely	Limited	Low	Unlikely	Minor	Low

16.5.4.8 Overall Risk Rating-Decommissioning Phase

A summary table of the risk categories identified for each aspect assessed in Sections 16.5.4.1 to 16.5.4.6 is presented in Table 16-13 The overall risk level is assigned the highest risk rating of all parameters assessed.

During the Decommissioning phase the highest risk rating is ranked as Medium associated with a potential peat slide**.** The risk rating due to a vehicular accident, is ranked overall as **Low.**

Table 16-13: Summary Construction Phase Risk Category Assessments

	Peat Slide	Vehicle Accidents
Parameter	**A**	**B**

Life, health and Welfare	Low	Low
Environment Habitats	Medium	Low
Environment Water Quality and Fisheries	Medium	Low
Infrastructure	Medium	Low
Social	Low	Low
Overall Risk level	**Medium**	**Low**

The risk matrix for the decommissioning phase hazards is presented in Figure 16-7. Letters representing Hazards are as per Section 16.5.1. with “A” denoting the peat slide and “B” denoting the vehicle accident.

Figure 16-7: Risk Matrix – Decommissioning Phase

Likelihood	Very Likely	5					
	Likely	4					
	Unlikely	3	B				
	Very unlikely	2				A	
	Extremely unlikely	1					
			Minor	Limited	Serious	Very serious	Catastrophic
			1	2	3	4	5
			Consequences				

16.6 Cumulative Impacts

16.6.1 Overview

The projects considered under cumulative assessment have been described in Chapter 1 of this rEIAR and are listed in **Table 16-14**. These are also presented on Figure 2.7 in Chapter 2 of this rEIAR.

Table 16-14: Projects considered for cumulative effects

Projects for cumulative assessment	Date of Original Planning Permission	Planning Ref	Date of construction works	Date of operations
Peat extraction: Turbary within wind farm site and immediately adjacent to the wind farm	n/appl	n/appl	n/appl	ongoing
Peat extraction: Turbary /peat extraction outside wind farm site	n/appl	n/appl	n/appl	ongoing
Sonnagh Old Wind Farm	Oct-00	GCC Reg. Ref. 00/3234	2004-2005	2005-date
Sonnagh Old 38kV grid connection	Oct-01	GCC Reg. Ref. 01/3074	2004-2005	2005-date
Keeldeery Wind Farm	2002	GCC Reg. Ref. 00/5248; ABP - PL 07 125978	2007	n/appl
Forestry within site	n/appl	n/appl	n/appl	n/appl
Forestry outside site	n/appl	n/appl	ongoing	ongoing
Moneypoint - Oldstreet 400 kV OHL	pre 1998; refurbishment application Oct 2017	TBC; Clare County Council (CCC) Reg. Ref. 16/1011; GCC Reg. Ref. 16/1747	pre 1998; Q2 2020	ongoing
Ennis - Shannonbridge 110kV OHL	pre 1998	pre 1998	pre 1998	ongoing
Tynagh 400MW Power Station	Oct-03	GCC Reg. Ref. 03/2943	2004-2006	2006-date
Tynagh 220kV Grid connection	Jul-04	GCC Reg. Ref 04/1974	2004-2006	2006-date
Gort Regional Water Supply Scheme	n/appl	n/appl	pre 1998	ongoing
Local OPW Flood Relief Scheme Gort	n/appl	n/appl	pre 1998	ongoing
Local Flood Relief Works at Kiltartan	n/appl	n/appl	2011-2012	ongoing
Flood Relief Works at Kinvarra	n/appl	n/appl	2015	2015-2016
Proposed Gort Lowlands Flood Relief Scheme	n/appl	n/appl	n/appl	n/appl
M18 motorway-Oranmore-Gort section	TBC	TBC	2015-2017	ongoing
Sand extraction at Cloghvoley	May-08	GCC Ref. Ref. 08/1664	post 2008	ongoing
Coillte Quarry- R353	TBC	(a) Quarry Reg QRY62	pre 2005 TBC	ongoing

Projects for cumulative assessment	Date of Original Planning Permission	Planning Ref	Date of construction works	Date of operations
Ballynakill Quarry	(a) pre 1963; (b) post 1990 (1997); c)June 2018	(a) Quarry Reg QY 6; (b) Ref. 07.SU0038; c) GCC 18 687	pre 2012 TBC	Ongoing
Planting in lieu of felling on wind farm	n/appl	n/appl	n/appl	n/appl
Works to Beagh Bridge	n/appl	n/appl	n/appl	n/appl

The potential for cumulative impact in terms of Major Accidents and Disasters has been assessed with respect to the identified hazard based on project type.

Peat slides: The cumulative impact of the various adjacent projects has been considered and assessed in detail in Chapter 10 in Section 10.4 from a peat stability perspective. Activities relating to projects within closer proximity to Derrybrien Wind Farm which were considered to have a higher potential for significant cumulative impacts have been considered in particular detail within chapter 10. These are Sonnagh Old Wind Farm, Keeldeery Wind Farm, adjacent coniferous forestry plantations and turbary/peat extraction off the wind farm site. It was assessed that these projects would not have a significant cumulative stability impact with the Derrybrien Wind Farm project based on their spatial separation with the Derrybrien Wind Farm, their lower elevation relative to Derrybrien Wind Farm site and the nature of the project activities.

<u>Sonnagh Old Wind Farm</u>

It is noted that a peat slide took place at Sonnagh Old Wind Farm in 2003 during its construction. This is discussed in detail in Chapter 10 where cumulative impact with the Derrybrien Wind Farm has been ruled out. The following summarises some of the key aspects of this assessment:

- The site activities during construction on the Sonnagh Old Wind Farm would be broadly similar to those on the Derrybrien Wind Farm site, depending on the design for the site access tracks (floated or founded on competent rock or mineral soil).
- Corresponding impacts on the receiving soils, geology and land would be similar in nature.
- A peat slide occurred in 2003 on the Sonnagh Old Wind Farm site. However, the cause of it has not been reported in literature.
- Based on aerial photography and geomorphological mapping by Dykes (2009) it appears that the slide initiated in an area of peat on shallow slopes of 2.5-4.0° along the upslope edge of a steep scarp of 3-4m high cliffs. Peat was displaced to the north over an area of about 0.50 to 0.75Ha from the upper slope and deposited over an area of about 1.25-1.50Ha on the shallow

slopes of 3.5° downslope from the escarpment. Debris from the slide appears to have reached the channel for the stream flowing from Lough Belsrah, approximately 450m downslope.

- Site activities at Sonnagh Old would not have given rise to cumulative stability impacts on the Derrybrien Wind Farm project mainly because they are entirely separate projects, located on different mountains, are topographically remote and in different river sub-catchment from each other

Turbary/peat extraction activities on the Wind Farm site and Immediately adjacent to the site

In consideration of the turbary/peat extraction activities on the wind farm site and immediately adjacent to the wind farm site it is understood that up until 2012 the extent of turf cutting carried out mechanically in the area is not known. However, the level of peat extraction was low and turf cutting was carried out by hand on a number of plots, normally in late Spring/early Summer.

It is understood that since 2012 a local peat cutting contractor has been retained by some of the plot owners to mechanically cut turf so there has been an increase in the number of plots where mechanical turf cutting has been carried out. 35 No. of the 136 No. turbary plots have been worked by mechanical means (hopper or saw cutting).

A PSRA has been undertaken for the turbary activities. Assuming that a peat failure could involve a very large peat slide in the worst case scenario, which is consistent with the methodology for the assessment of stability impacts for the wind farm (Section10.2.4.1, Chapter 10), then:

- Where the likelihood of a peat failure is Very Possible to Likely (L=4.0 to 5.0) as a result of peat harvesting on the turbary plots without appropriate mitigation measures, then the effect of the stability impact on the peat would be High and Significant.
- Where the likelihood of a peat failure is Possible to Very Possible (L=3.5), then the effect of the stability impact on the peat would be Medium to High and Moderately Significant.

For the range of wind farm activities that occurred on the site during this period (O&M 2006 – 2020) and involved surcharge loading on the peat or floating roads, the effect that surcharge loads had on the stability of the peat was Low to Very Low and only Slightly Significant (see **Error! Reference source not found.**2.1, Chapter 10). No peat failures occurred as a result of the wind farm activities during this time.

When this is compared to the significance of the stability impacts of site activities for peat extraction in the turbary plots it can be seen that, due to the increased level of mechanical extraction carried out in the area since 2012, the cumulative effect on the stability of the peat temporarily increased to Moderately Significant or Significant in the plots where the mechanical peat extraction was being carried out. The highest risk of a peat failure was at the time that the mechanical extraction works were being

carried out and the effect was brief or temporary, lasting only a few days in each area. This has been rated a Very Possible to Likely in accordance with the peat stability risk assessment. Therefore, in accordance with the classification set out in Table 16-1 this has been assessed as equating to **likely** for these plots in the absence of mitigation. This is considered as part of this assessment of Major Accidents.

Two localised peat failures occurred during the operation phase of the wind farm in the Turbary area due to harvesting activities, the details of which are discussed in detail in section 10.4 of Chapter 10.

It was not considered that significant cumulative impacts have occurred or will occur with any of the remaining listed projects in any phase of the Derrybrien Wind Farm Project life.

16.6.2 Construction Phase

The following existing infrastructure was installed prior to 1998 and will likely remain in place into the future:

- Moneypoint - Oldstreet 400kV OHL
- Ennis - Shannonbridge 110kV OHL

The following projects/activities were under construction or underway during construction of the Derrybrien Wind Farm Project and the main construction works had commenced prior to the Derrybrien Wind Farm peat slide incident in October 2003.

- Sonnagh Old Wind Farm
- Turbary/peat extraction outside wind farm site
- Turbary/peat extraction inside wind farm site and immediately adjacent
- Forestry outside site-tree felling

The construction of the following projects also coincided with the construction of the wind farm Project but commenced construction after the peat slide at Derrybrien.

- Tynagh 400MW Power Station
- Tynagh 220kV Grid connection
- Ballynakill Quarry

Peat Slide: Chapter 10 Section 10.4.5 indicates that that the results of the Peat Stability Risk Assessment show that there are significant areas of the turbary plots where the likelihood of a peat failure due to mechanical peat harvesting under uncontrolled conditions without appropriate mitigation measures is Very Possible to Likely. These zones are located in areas where there are compounding risk factors in relation to peat instability. The interpreted likelihood of a peat failure and the corresponding effect of the stability impact are only applicable in those areas where mechanical peat harvesting is carried out. The extent of mechanical peat harvesting

in the area up to 2012 is not known. However, the level of turf cutting after the windfarm was constructed has generally been low. Historically, turf cutting was carried out by hand on a number of plots, normally in late Spring/early Summer harvesting is actually carried out. No significant peat slide events were recorded from turbary activities during construction. There are no cumulative impacts of significance with regards to site stability for the construction phase of the project.

Forest/Gorse/Peat Fires: It is noted that forest/gorse fires forestry activities within the site has been assessed from a fire risk perspective in Section 16.5.1.

It is possible that fires could have arisen on forested/gorse/bog outside the site and spread onto the wind farm site as happened in 2015. (Section 16.5.3). Likewise, there is a potential for cumulation of effects arising from fire at the Derrybrien Wind Farm with adjacent forestry and peatlands.

There was limited potential for major fires from the wind farm project with the Sonnagh Old Wind Farm construction and existing overhead transmission lines and therefore the risk of cumulative effects arising was unlikely.

Small aircraft hazard: While there was a risk of small aircraft collision with tall features and structures such as turbines on other wind farms and forestry, no cumulation of effects arise from Derrybrien wind farm with other wind farms or adjacent forestry occurred as the effects of such incidents are very local and not cumulative.

16.6.3 Operational Phase

The following activities/projects were underway or under construction and will continue during the operation phase of Derrybrien Wind Farm Project:

- Turf cutting within wind farm site and immediately adjacent to it
- Turf cutting outside wind farm site
- Forestry outside site-felling
- Coillte Quarry- R353
- Ballynakill Quarry
- M18 motorway-Oranmore-Gort section (2015-2017)
- Sand extraction at Cloghvoley (post 2008)
- Local Flood Relief Works at Kiltartan (2011-2012)
- Flood Relief Works at Kinvarra (2015-2016)

Peat slides: Chapter 10 identifies that from a peat stability perspective no significant cumulative impacts are assessed due to the above projects with the exception of the Turf cutting within wind farm site and immediately adjacent to it. In Section 10.4.5 of Chapter 10 it is indicated that:

"Cumulative site stability impacts arising from peat extraction in turbary plots on the wind farm site and adjacent to it could potentially occur where specific peat harvesting methodologies are utilised. The potential impact will not arise as a direct result of wind farm continued operational activities or decommissioning activities as these have been mitigated against but from the separate peat turbary activities occurring outside of the control of Gort wind farms as exercised under turbary rights. These potential site stability impacts from turbary activities relate primarily to the use of mechanical peat harvesting equipment on turbary plots which have been assessed as having a possible likelihood of a peat failure which could range from localised instability to potentially a large scale peat slide in the worst case scenario".

Where the mitigation measures are implemented by the turbary rights holders, their agents and by Gort Wind Farms Ltd. then the interpreted likelihood of a peat failure occurring as a result of mechanical peat harvesting in the turbary plots will reduce to a residual level of Low, (see Chapter 10, Section 10.4.5.2.4). The corresponding effect on the stability on the peat will be Medium to Low, which is of Slight Significance. This would also represent the residual effect of stability impacts on the peat where no mechanical peat harvesting is being carried out in the turbary areas

During the O&M phase of the project to mid-2020 there have been two areas of localised peat failure in the Turbary area of the site, one in the vicinity of T39 (turbary plot 30), initiating sometime between 2015 and 2018, and one approximately equidistant from T34, T37 and T38 (turbary plot 161), which occurred sometime c. 2018. Neither failure event involved significant displacement of peat, i.e. the failed peat was contained within the turbary plots, and both failures were approximately 2500m^2. Neither failure event would be considered a major accident.

There are areas in the turbary area of the site which are susceptible to larger peat slides. The likelihood of a peat slide as a consequence of these cumulative activities, in a number of the plots, prior to mitigation is assessed as likely, in accordance with Table 16-1. Using the impact categorisation in Table 16-2 the risk is assessed as **high** for Environment and Infrastructure and **medium** for life, health and welfare, and social impacts.

Therefore, mitigation for the plots where a likelihood (in accordance with the PSRA) of peat instability is very possible to likely is necessary, see Chapter 10, Section 10.4.5.2.4.. This will consist of restriction of harvesting to manual cutting only i.e. no mechanical harvesting.

In the other plots where the likelihood of a peat failure is possible to very possible, loading of any mechanical plant shall be restricted to an acceptable level. Other general mitigation to be implemented across the turbary area can be summarised as follows:

- The existing drainage network shall be maintained;
- Periodic Inspection of peat harvesting activities shall be undertaken;
- Drainage works shall be undertaken in the areas of the existing failure;

- No turbary works shall be undertaken during decommissioning of the wind farm

The post mitigation likelihood of a peat slide occurring as assessed by the peat stability risk assessment is low. In accordance with the classification set out in Table 16-1 this has been assessed as **unlikely**.

Using the impact categorisation in Table 16-2 the risk is assessed as **low** for the operation phase for Impact to Life, Health and Welfare and Social, and **medium** for Land and Habitat, Water Quality and Infrastructure with the various mitigation measure in place.

The wind farm roads for the Keeldeery Wind Farm were built in 2007 but turbines were not installed. No cumulation of effects arises from Derrybrien Wind Farm with Keeldeery Wind Farm.

No cumulation of effects arises from Derrybrien Wind Farm with flood relief works which are at considerable distance from the wind farm and are in low-lying areas.

No cumulation of effects arises from Derrybrien Wind Farm with quarries which are at considerable distance from the wind farm.

Forest/Gorse/Peat Fires: Fire encroaching from adjacent gorse/forest is a potential risk arising from turbary and forestry. There is no potential for major fires from the Derrybrien wind farm project with the other wind farms, overhead transmission lines, Gort Regional Water Supply, flood relief schemes and the M18 Motorway Project and therefore no risk of cumulative effects arise.

Small aircraft hazard: While there is a risk of small aircraft collision with tall features and structures such as turbines on other wind farms and forestry no cumulation of effects arise from Derrybrien wind farm with other wind farms or adjacent forestry as the effects of such incidents are very local and not cumulative.

Because the turf cutting, flood relief schemes, and motorway project do not contain tall features and are on carried out on low lying ground no risk of collisions arise and therefore no risk of cumulative effects arise.

16.6.4 Decommissioning Phase

It is envisaged that the activities considered in Section 16.6.3 (operation phase) will be still be underway circa 2040 when it is proposed to decommission the wind farm project.

Peat slides: The assessment of cumulative impact at decommissioning prior to the implementation of mitigation measures is described in Chapter 10, Section 10.4.5 and would be similar to that described in Section 16.6.3 above .

The post mitigation likelihood of a peat slide occurring as assessed by the peat stability risk assessment is low for the Turbary activities in this area of the site, with the implementation of mitigation. Mitigation involves the temporarily ceasing of harvesting by mechanical means during decommissioning. In accordance with the classification set out in Table 16-1 with the mitigation in place, the likelihood has been assessed as **very unlikely**.

Using the impact categorisation in Table 16-2 the risk is assessed as **low** for the operation phase for Impact to life, Health and Welfare, Social, Land and Habitat and Infrastructure, and **medium** for Water Quality.

16.7 Remedial/Mitigation Measures

16.7.1 Construction Phase

Peat slide risk: Mitigation measures were put in place prior to the peat slide in construction phase 1 as detailed in Section 10.5 of Soils and Geology chapter which addressed peat/site stability.

In construction phase 2 (June 2004-March 2006), following the peat slide, a significantly increased level of site investigation was carried out and assessments of each activity separately and in combination (using current risk assessment methodologies) were undertaken. Mitigation measures were implemented to prevent any further peat instability on the site. These broadly consisted of:

- Additional geotechnical investigations, stability analyses, testing, monitoring and geotechnical supervision during the construction stage of the project (e.g. geotechnical assessment and full-scale proof testing of floating roads);
- Changes to the site characteristics due to improved drainage and an increase in the strength of the peat under sustained dead load surcharges (i.e. the floating roads, peat repositories and material side cast areas); and
- Disposal of excavated material in designated repositories on the peat slopes where the peat stability had been assessed as having an adequate margin of safety, and in the borrow pits

Emergency Management Plan: During the construction phase, an emergency plan was in place, which:

- Identified the hazards on site
- Listed contact numbers of emergency services
- Defined the roles and responsibilities of key personnel on site
- Detailed emergency procedures in the event of specific major accidents
- Outlined the safety systems available which would reduce the impact of a major accident

Site emergency procedures were updated following the peat slide.

16.7.2 Operational Phase

Peat slide: Mitigation for the peat stability for the Derrybrien Wind Farm site are detailed in Section 10.4 Chapter 10. For the cumulative impact with the turbary activities the mitigation is set out in Section 10.5. Detailed peat stability risk assessments in relation to each activity and the combined activities which have occurred to date, are occurring and will occur during project operation have been undertaken.

Effective and proven risk mitigation measures are in place at the project site to reduce the likelihood of a peat slide to a low or negligible level as detailed in Chapter 10-Soils, Geology and Land.

Aircraft collision: As required by the relevant planning consents, details of aeronautical requirements were agreed with the Planning Authority (Galway County Council) and the as-constructed co-ordinates of turbines and maximum elevation of each turbine were provided to the planning authority. [35] The aeronautical requirements comprised the installation of low-intensity aviation lights on certain turbines. Low-intensity aviation lights were installed on T1, T47, T52, T65, T44, T46, T71, T18 and T62 (9 in total).

The Irish Aviation Authority (IAA) was provided with the as-constructed co-ordinates of turbines and maximum elevation of each turbine on completion of development. The wind farm is marked on the relevant Aeronautical chart.

The Project location is outside the aviation exclusion zone for Galway Airport and other airfields in the County so as not to affect the safe operation of these airport/airfield facilities.

Forest/Gorse Fire: The mitigation measures comprise:

a) Restrictions apply to burning of vegetation and DAFM national warning systems
b) The use of firebreaks

Restrictions apply to burning of vegetation.

Under Section 39(1) of the Wildlife Act, 1976, it is an offence to cut, grub, burn or otherwise destroy any vegetation growing on any land not then cultivated between 1st March and 31st August in any year. Landowners wishing to carry out legally permitted prescribed burning must notify in writing all forest owners within one mile of the wood, and the local Garda station, between 7 and 35 days in advance of the burning operation. All burning operations are required to be notified to the Fire Service before burning commences. The Forest Service of the Department of

[35] ABP Reg. Ref. PL.07.106290 (Condition 6); ABP Reg. Ref. PL.07.106292 (Condition 6); ABP Reg. Ref. PL.07.122803 (Condition 7)

Agriculture, Fisheries and Food (DAFM) has prepared a draft Code of Best Practice in relation to prescribed burning.[36]

A National Forest Fire Risk Warning System set out fire danger rating systems, and fire suppression tactics per fire risk condition. Fire suppression tactics are identified for forest risk conditions -ranging from non-intervention to aerial firefighting.

Forest Fire Danger Notices are issued by DAFM during the main wildfire risk season from February through to September. These notices provide forest owners and managers with advance warning of high forest risk weather conditions and permit appropriate readiness measures to be taken in advance of fire outbreaks. Increasing levels of preparation and vigilance are required as the risk levels scale from Green through to Red.

Firebreaks

Gort Wind Farms Ltd has removed some of the flammable vegetation over a 5m wide strip around much of the perimeter of the site to form a firebreak.

Emergency Management Plan: The hazards on site have been identified for the operational phase and procedures are in place to address them, as follows:

- Accidents
- Fire in control room and/or switchgear room on electrical equipment
- Fire involving wood, paper in control room or in switchgear room
- Forest/gorse fire
- Fire in tower
- Landslide

Details of local Fire Service Control Centre are provided in Emergency Procedure.

16.7.3 Decommissioning Phase

Peat slide: Mitigation measures for the peat stability for the Derrybrien Wind Farm site are detailed in Section 10.4 Chapter 10. For the cumulative impact with the turbary activities the mitigation is set out in Section 10.5. Detailed peat stability risk assessments in relation to each activity and the combined activities which will occur during project decommissioning have been undertaken.

Effective and proven risk mitigation measures are in place at the project site to reduce the likelihood of a peat slide to a low or negligible level as detailed in Chapter 10-Soils, Geology and Land.

Emergency Management Plan: A Major Accident and Emergency Plan will be put in place during the decommissioning phase of the project, which will:

- Identify the hazards on site
- Provide contact numbers of emergency services
- Define the roles and responsibilities of key personnel on site

[36] Department of Agriculture, Food and the Marine, Prescribed Burning Code of Practice - Ireland

- Detail emergency procedures in the event of specific major accidents
- Outline the safety systems available which will reduce the impact of a major accident

16.8 Residual Impacts

16.8.1 Construction Phase

A peat slide occurred during project construction in 2003.

As set out in Section 16.5.2 the peat slide resulted in displaced peat affecting land and habitats, water quality and a fish kill. These have largely recovered as follows:

- Surveys undertaken along the peat slip areas in 2011 and 2018 have shown almost full recovery of vegetation and habitat structure throughout the land affected by the peat slide.
- Macroinvertebrate water quality had effectively fully recovered within 3-years of the peat slide.
- Fish surveys showed that the fish population structure had largely recovered within 6 years of the peat slide.

There were no residual impacts on cultural heritage as a result of the peat slide during project construction.

No significant effects arose and therefore there were no residual effects in terms of life, health and welfare, social or infrastructural.

16.8.2 Operational Phase

Effective and proven risk mitigation measures are in place to reduce the likelihood of a peat slide to a low or negligible level. No residual impacts have arisen or are predicted with respect to major accidents and disasters during the project operational phase.

16.8.3 Decommissioning Phase

No residual impacts are predicted with respect to major accidents and disasters during project decommissioning phase.

16.9 References

Department of Agriculture, Food and the Marine, "*Forest Fire Risk Warning System"*

Department of Agriculture, Food and the Marine, *"Prescribed Burning Code of Practice – Ireland"*

Department of Agriculture, Food and Marine, *"Forest Statistics Ireland",* 2019

Department of Defence, *"Strategic Emergency Management Guideline 3- Critical Infrastructure Resilience"*, Feb 2019

DOEHLG, National Directorate for Fire and Emergency Management –*"Keeping Communities Safe-A Framework for Fire Safety in Ireland"*, Feb 2013

DOEHLG, *"Wind Energy Planning Guidelines for Planning Authorities"*, 2006

DOEHLG, *"Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment",* August 2018

DHPLG, *"Draft Wind Energy Development Guidelines",* December 2019

DHPLG*," Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*", August 2018

DOEHLG, *"A Framework for Major Emergency Management- Guidance Document 1-A Guide to Risk Assessment in Major Emergency Management"*, January 2010

DOEHLG, Department of Health and Children, Department of Justice Equality and Law Reform, *"A Framework for Major Emergency Management*", 2006

EPA, *"Guidelines on the information to be contained in Environmental Impact Statements",* March 2002

EPA (2015) *"Draft Advice notes on current practice (in the preparation of Environmental Impact Statements*" Draft September 2015

EPA (2017) *"Draft Guidelines on the information to be contained in Environmental Impact Statements",* Draft August 2017

EPA, "*Draft Advice Notes for Preparing Environmental Impact Statements"*, September 2017

EPA, *"Guidance to Licensees/COA holders on the Notification, Management and Communication of Environmental Incidents*", 2010

European Commission, *"Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)*", 2017

European Commission, Directive 2014/52/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014

European Commission, DIRECTIVE 2012/18/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

European Commission, "*Environmental Impact Assessment of Projects Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU)"*, 2017

European Federation of Geologists, "*Advice Document to the European Commission on Environmental Impact Assessment – Implementation and Practice*", 2003

European Parliament resolution of 21 September 2010 on the Commission communication: *A Community approach on the prevention of natural and man-made disasters* (2009/2151(INI)), (2012/C 50 E/04)

Fehily Timoney & Company, *"IWEA Best Practice Guidelines for the Irish Wind Energy Industry"*, March 2012

GSI, "*Landslides in Ireland*" (2006) (Ed. Ronnie Creighton, GSI)

GSI "*National Landslide Susceptibility Mapping Project Summary",* 2016

HSE, "*HSE Emergency Management Area 2 Emergency Plan (Covering Geographical Areas of Counties Galway, Mayo and Roscommon*", January 2020.

IGI, "*Geology in Environmental Impact Statements-A Guide",* Sept 2002.

IWEA & SEAI, "*Best Practice Guidelines for the Irish Wind Energy Industry*", 2008

Long; M & Boylan.,N., "*Peat Slides in Ireland – Causes and Prescriptions*" Dr Mike Long & Dr Noel Boylan* UCD School of Architecture, Landscape & Civil Engineering, 1st May 2009

MacCulloch F., "*Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume/Low Cost Roads Over Peat*", Forestry Civil Engineering, Forestry Commission, Scotland, January 2006

Saorgus Energy -EIS submitted with GCC Reg. Ref. 97/3470 / ABP Reg. Ref. PL.07.106290 – 'the Phase 1 EIS', EIS submitted with GCC Reg. Ref. 97/3652 / ABP Reg. Ref. PL.07.106292 – 'the Phase 2 EIS', EIS submitted with GCC Reg. Ref. 00/4581 / ABP Reg. Ref. PL.07.122803 – 'the Phase 3 EIS', collectively as 'the Original Environmental Impact Statements' or the 'Original EISs'.

Scottish Executive: "*Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments*", Dec 2006

Scottish Government, "*Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Prepared for Energy Consents Unit Scottish Government*" Second Edition, April 2017

UN, "*Hyogo Framework for Action (HFA) 2005-2015: Building the Resilience of Nations and Communities to Disasters*",

UNISRD, "*Sendai Framework for Disaster Risk Reduction 2015-2030*"

UN General Assembly "*Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction*", Dec 2016