Beaulnamelly,
Derrybrien,
Loughrea,
Co Galway

H62R286

AN BORD PLEANÁLA
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ABP- _____
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An Bord Pleanala,
64 Marlborough Street
Dublin D01 V902.

06th September 2021

Notice of objection to the Derrybrien Windfarm Substitute Consent "Exceptional Circumstances" Application by the ESB PL07 308019-20

A Chara,
I request An Bord Pleanala to refuse Substitute Consent to the windfarm development at Derrybrien (application No PL07 308019-20) on the basis that "exceptional circumstances" do not exist in this case.

As a member of the local community we should be involved in the public consultation process in respect of the EIA, which would be a preliminary step in the Planning Application under the 2010 Act, for Substitute Consent, we are disappointed that another Planning Application has been made in August 2021. No public consultation process has taken place in regard to this windfarm project.

Criteria for exceptional circumstances.

- Whether regularisation of the development concerned would circumvent the purpose and objectives of the Environmental Impact Assessment Directive or the Habitats Directive. **(Yes it would).**
- Whether the applicant had or could reasonably have had a belief that the development was not unauthorised. **(Yes, were aware of unauthorised development)**
- Whether the ability to carry out an assessment of the environmental impacts of the development for the purposes of an environmental impact assessment or an appropriate assessment and to provide for public participation in such an assessment has been substantially impaired. **(Yes it has).**
- The actual or likely significant effects on the environment or adverse effects on the integrity of a European site resulting from the carrying out or continuation of the development. **(Yes there are long term negative effects).**

- The extent to which significant effects on the environment or adverse effects on the integrity of a European site can be remediated. **(No not possible).**
- Whether the applicant has complied with previous planning permissions granted or has previously carried out an unauthorised development. **(No).**
- Such matters as the Board considers relevant. **(Two CJEU cases against Ireland and non compliance with EIA and Habitats Directives).**

In March 2021, the ESB erected a sign along the entrance roadway to Derrybrien bog warning turbary owners of peat instability. My contractor refused to enter Derrybrien bog to cut turf in 2021 therefore my constructional right to cut my turf and property rights have been grossly interfered with by the ESB and Gort Windfarms Limited. I am objecting in the strongest possible way to the application by the ESB that exceptional circumstances exist in this case. An Bord Pleanala cannot allow a situation where a turf hopper is stopped going onto Derrybrien bog and a crane with a lifting capacity of 300 tonnes is allowed onto the same bog. Regardless of the spin in the rEIAR the truth is that the weights of the large cranes are 72 tonnes and 60 tonnes.

An Bord Pleanala must issue a clear decision stating that the ESB / GWL application do not comply with the "Exceptional Circumstances" criteria and the precautionary principle requires to be applied to this Derrybrien windfarm project.

As in CJEU Case C – 258/11. See relevant extract below.
46 Consequently, if, after an appropriate assessment of a plan or project's implications for a site, carried out on the basis of the first sentence of Article 6(3) of the Habitats Directive, the competent national authority concludes that that plan or project will lead to the lasting and irreparable loss of the whole or part of a priority natural habitat type whose conservation was the objective that justified the designation of the site concerned as an SCI, the view should be taken that such a plan or project will adversely affect the integrity of that site.

*47 **In those circumstances, that plan or project cannot be authorised on the basis of Article 6(3) of the Habitats Directive**. Nevertheless, in such a situation, the competent national authority could, where appropriate, grant authorisation under Article 6(4) of the directive, provided that the conditions set out therein are satisfied (see, to this Waddenvereniging and Vogelbeschermingsvereniging, paragraph 60). effect,*

48 It follows from the foregoing considerations that the answer to the questions referred is that Article 6(3) of the Habitats Directive must be interpreted as

meaning that a plan or project not directly connected with or necessary to the management of a site will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of SCIs, in accordance with the directive. The precautionary principle should be applied for the purposes of that appraisal.

On those grounds, the Court (Third Chamber) hereby rules:
Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora must be interpreted as meaning that a plan or project not directly connected with or necessary to the management of a site will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of sites of Community importance, in accordance with the directive. ***The precautionary principle should be applied for the purposes of that appraisal.***

I reserve the right to challenge the decision if the precautionary principle is not applied in this case for the reasons outlined above.

In support to my objection please see enclosed a copy of a recently published ***Technical Assessment of Derrybrien Windfarm and Ancillary Works by Arcadis Design & Consultancy July 2021*** which identify very serious deficiencies with the rEIAR submitted with the substitute consent application.

As you will be aware there are ongoing fines payable by Ireland in respect of the failure to regularise the situation of the Derrybrien Windfarm arising from the decision of the European Court of Justice in relation to these matters.

I look forward to a favourable response from you as a matter of urgency.

Yours sincerely,

Michael Mahony

ARCADIS Design & Consultancy for natural and built assets

TECHNICAL ASSESSMENT OF DERRYBRIEN WINDFARM AND ANCILLARY WORKS

Under Specific contract No. [redacted]

JULY 2021

CONTACT

[redacted]

m [redacted]

e [redacted]

Version Control

Version	Date	Author	Approver	Status
1	22/03/2021	[redacted]	[redacted]	Template for EC Approval
2	30/4/2021	[redacted]	[redacted]	Draft for Issue
3	02/07/2021	[redacted]	[redacted]	Updated based on comments

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EXECUTIVE SUMMARY

Introduction

ARCADIS was commissioned to carry out a technical assessment with the purpose of establishing whether there is a potential infringement of EU law associated with the Derrybrien Wind Farm Project, County Galway, Republic of Ireland.

The operational Derrybrien Wind Farm Project is located in the northern part of the Slieve Aughty Mountains in County Galway, approximately 11km south of Loughrea, 13km north east of Gort and 24km west of Portumna.

The Project comprises 70 No. Vestas V52-850 kW wind turbines and substation, a grid connection comprising an overhead line (approximately 7.8km long) and Agannygal Substation connecting the wind farm to the National Grid and all associated developments. The owner and operator of the wind farm is Gort Windfarms Limited, a subsidiary of the Electricity Supply Board (ESB). Planning permissions were obtained between 1998 and 2002.

Construction of the wind farm commenced in June 2003 and continued to 2006. In October 2003 a peat slide occurred within the wind farm site boundary to the south of the site caused the disturbance and partial displacement of peat and forest debris. Displaced peat remobilised following a period of heavy rain. During the peat slide, debris passed down a stream valley and into an area of open flatter ground where it lost momentum and was deposited upstream of a minor road bridge. Some peat was transported further down the Owendalulleagh River with small amounts of peat deposited along the river banks. The estimated volume of peat in the peat slide area, based on the extent of the peat slide area was 450,000m^3 dispersed over a wide area.

The wind farm has been in continuous operation since 2006 and the operator envisages that it will operate until circa 2040, at which time it will be decommissioned.

In 2008, the Court of Justice of the European Union (CJEU) delivered a judgment against the State concluding that Ireland had failed in its obligations to assess environmental effects in accordance with European Directives prior to granting of the planning permissions for the Derrybrien wind farm. In 2019, there was a further CJEU judgment against the State for failure to comply with the 2008 judgment. Galway County Council has served a Notice under the Planning and Development Acts directing Gort Windfarms Limited (the owner and operator of the wind farm) to submit an application for Substitute Consent to An Bord Pleanála. The remedial EIA process started on 21 August 2020 when the developer submitted a substitute consent application to An Bord Pleanala. The Application includes environmental assessments which are intended to demonstrate compliance with the Environmental Impact Assessment and Habitats Directives, which will assist An Bord Pleanála carrying out a full environmental assessment of the Derrybrien Wind Farm Project. These assessments also address all the works that were undertaken in response to the peat slide in 2003. Concerns have however been raised by local complainants that the process is not adhering to the EIA Directive requirements and that key issues of concern are not being addressed.

Background to the Technical Assessment

This report comprises an analysis of the documentation and process supporting the Remedial Environmental Impact Assessment of Derrybrien Wind Farm and ancillary works. The documentation reviewed includes the Remedial Environmental Impact Assessment Report (rEIAR), Remedial Natura Impact Statement and information provided by third parties commenting on this process (which are publicly available) as well as documentation from complainants submitted to DG Environment.

The overall objective has been to assess if the EIA remedial process has fairly assessed the key impacts over time and addressed appropriately the need for remediation and compensation measures.

Due to the historic peat slide that occurred, peat stability has been a key focus of this assessment. Given the location of the wind farm on high ground with peat soils, the interaction between this development and the surrounding land uses, in particular, with regard to water runoff and possible downstream pollution and flooding

has also been considered as a key issue. Assessment of likely impacts of the development on protected habitats and species are also an important area of focus in the review.

Compliance with European Union and Irish Environmental Legislation and Process

The rEIAR correctly references Directive 2011/92/EU as amended by Directive 2014/52/EU. The relevant sections of this report give consideration to whether the requirements of Articles 2,3 and 5 have been met by the rEIAR, and in particular the requirements of Article 3 and Annex IV are considered in depth. It should however be noted that the rEIAR addresses the disposal and recovery of waste within the description of the project (in accordance with Annex IV Section 1) however there is no attempt to consider the likely significant effects of the project on the environment resulting from the disposal and recovery of waste (in accordance with Annex IV Section 5).

Article 5 (1) requires the developer to include a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment. This has been given very limited consideration, as set out in the section below.

Article 6 of the EIA Directive focuses on public consultation and under Article 8 of the EIA Directive 'the results of consultations and the information gathered pursuant to Articles 5 to 7 shall be duly taken into account in the development consent procedure.' A five-week participation window was provided for public consultation on the rEIAR. Whilst there has been an opportunity for public participation to take place, there is a question mark over the effectiveness of participation enabled by this opportunity, given the complex nature of the topic, the volume of application documents and the reasonableness of the timeframe for comments / inputs by members of the public. The rEIAR Non Technical Statement states "Gort Wind Farms Limited has engaged with the general public in relation to the Derrybrien Wind Farm Project throughout the development and operation of the Project." All of the complaints received by the EC contradict this claim and a complaint was made by a local resident that although there was a 30-day public consultation period starting on 21 August 2020, the documentation was not accessible until 27 August 2020.

Chapter 1: Introduction

Chapter 1: Introduction of the rEIAR gives a comprehensive account of the background to the project, an overview of the CJEU Judgements, the requirement for the rEIAR and the general methodology followed. The qualifications and number of years' experience of the main authors are reported, demonstrating that the rEIAR has been coordinated by competent experts, as required by the EIA Directive

No details are provided to document the extent to which the scope of the rEIAR has been discussed and agreed with the competent authority. It appears that no EIA Scoping exercise has been undertaken or Scoping Report prepared. The European Commission (EC) Guidance on Scoping (2017) notes that scoping is not mandatory under the EIA Directive, however the guidance states that it is good practice to undertake scoping even if it is not required by legislation (Section 1.4).

The overarching methodology is set out and appears comprehensive and the significance criteria proposed adequately cover the characteristics of the potential impact set out in Annex III (3) of the EIA Directive (e.g., extent of the impact, magnitude of impact, probability, duration, frequency and reversibility).

It should be noted that the rEIAR addresses the disposal and recovery of waste within the description of the project (in accordance with Annex IV Section 1) however there is no attempt to consider the likely significant effects of the project on the environment resulting from the disposal and recovery of waste (in accordance with Annex IV Section 5).

Details are set out demonstrating that the requirements of Article 6(2) of the EIA Directive have been met in terms of informing the public about the Substitute Consent Application and the EIA Process.

Chapter 2: Project Description

The rEIAR gives a comprehensive description of the project in line with the EIA Directive. No significant omissions were noted with regards to the information provided.

Chapter 3: Alternatives

Alternatives are considered for the Do-nothing; continued operation and later decommissioning; alternative renewable energy projects on site; and decommissioning and remediation alternatives for the wind farm site.

The assessment of the first three bullet points includes a comprehensive comparison of the environmental effects in line with the requirements of the EIA Directive. However it is questionable how likely the developer is to develop alternative energy projects on the site and therefore how far these constitute 'reasonable alternatives'. The aim of the alternatives assessment is to help embed environmental considerations into the evolution of the project, it is questioned the extent to which this part of the assessment adds to the quality of the rEIAR, and in particular in aiding the decision making process for the substitute application.

Very limited consideration has been given to alternatives for decommissioning and remediation options, or any alternatives given regarding amending the design/layout of the existing wind farm to potentially reduce the identified environmental impacts. The option of removal of one or more parts of the development has not been considered in any detail and the reasons for selecting the chosen option are also not dealt with in much detail.

Chapter 4 Population and Human Health

The chapter is broadly compliant with legislation and best practice, although further detail around population, recreation and amenity would enable a more robust assessment. A more detailed understanding of communities in the baseline would assist with later assessment of impacts, notably positive impacts relating to community benefits. There is no detail around farming (other than a brief reference to forestry and turbary) from a business / viability perspective, although negative effects have been identified in relation to farmland and farming activities. It is not clear whether consultation with stakeholders has taken place in relation to baseline data collection.

Conclusions made in relation to population impacts associated with the wind farm highlight the various positive social impacts resulting from employment and community benefits attributed to the project. The chapter also states that the project 'contributes significantly to the displacement of imported fossil fuel cost of economic benefit to the Irish economy and will continue to do so throughout the lifetime of the project' although no real detail / justification is presented in relation to this. No significant adverse impacts on population have been identified and these conclusions are considered reasonable.

The recent placement of a 'Hazard' sign at the entrance to the turbary stating that there is a risk of instability if peat cutting activities are undertaken has prevented local residents from obtaining a fuel supply for use next winter and does not accord with the 'slight positive economic benefit' in relation to turbary referred to in the chapter.

The assessment tables for human health covers a range of assessment periods (construction, impacts which occurred during the peat slide, operational phase 2006 to end 2020, operational impacts currently occurring, operational impacts likely to occur and decommissioning impacts). The assessments are high level in nature and do not provide sufficient detail to justify conclusions within this chapter. The human health section concludes that 'the distance between wind turbines and occupied buildings is always greater than that necessary to meet safety requirements. The turbines in use for Derrybrien Wind Farm have a proven record in terms of safety and reliability. In summary, the operation of the wind farm to date has not and future operation will not result in significant adverse impacts on human health'. This conclusion does not adequately reflect the assessment that has been made of human health effects throughout the chapter nor the potential issue around slope instability and potential for peat slide events.

Chapter 5 Noise and Vibration

Generally, the noise and vibration assessment is a robust and considered assessment based upon acceptable guidance and methodologies. In general, the conclusions of the Chapter seem reasonable and are accepted.

Key concerns relate to the issues raised relating the status of the property where adverse impacts are predicted to potentially occur during operation and decommissioning and are not controlled as the property is stated to be unoccupied. Assurances would be needed that this is the case for the lifespan of the wind farm and the decommissioning phase for the conclusions of the Chapter to be acceptable. Should this not be the case, and no assurances can be made that the property would remain unoccupied, then there is a potential for adverse

impacts which have not suitably been controlled within the works presented and additional mitigation may be necessary. These adverse impacts also include night-time operational impacts which would be a key concern for any resident.

Chapter 6 Shadow Flicker

There are a few minor inconsistencies within the methodology and scope of the chapter, but on the whole the approach follows the relevant guidance.

Only one receptor is considered to be within range to be affected by shadow flicker effects resulting from the project. This receptor is a currently uninhabited building (as described for noise above), but despite this, the rEIAR states that the property would not experience significant effects sufficient for mitigation to be considered. The rEIAR states that if a complaint from a future resident is received, mitigation measures which are outlined, will be utilised. It is recommended that there is a commitment to mitigation measures (as outlined above for noise) if the property becomes occupied.

Chapter 7 Biodiversity (Terrestrial Ecology)

The document is very difficult to follow, with large amounts of unbroken text. Greater structure and tabulation will help the reader navigate the assessment. There are additional legislation and guidance that should be included in an update of the rEIAR. The baseline is under described for amphibians and common lizard, badger, breeding and wintering birds other than Hen Harrier, roosting bats, otter, red squirrel and pine marten. Some of the surveys discussed are below best practice. It is also slightly confusing as to timing of the baseline as it is sometimes inconsistently described.

A table would be helpful with survey dates, guidance followed, and deviations from guidance clearly stated. An alternative means of assessment should be presented when survey data are not available. Clear scoping in and out with justification for each receptor should be presented, ideally in a tabular form. Clear limitations and precautionary assessment methods statements should also be listed per receptor. Given that this is a recreation of a baseline in the past, the CIEEM Guidance on Ecological Survey and Assessment in the UK During the COVID-19 Outbreak presents useful alternative methods of survey and data gathering and would be useful in this case.

Greater detail is required as to the justification of the value of the individuals with clearly stated data limitations and precautionary assessment. Structured guidance on evaluation for all receptors should be clearly stated along with an evaluation statement for each receptor. For example, if determining that a receptor is common and widespread national data should be evidenced, assessment at a global scale should also be employed for receptors that are globally scarce/rare.

Explanation as to the different assessment process applied for birds (have presumed Percival 2003) should be confirmed).

Tabulation of impacts and impact pathways scoped in and out, with justification would be helpful. Clearfelling of woodland to facilitate and enhance the development should be systematically assessed for all receptors. Habitat loss due to the development does not seem to have been assessed. Consistent structure throughout the document per receptor should be applied.

Operational effects are under assessed on habitats. Birds have been under assessed in general, and there is no assessment of the potential impacts from the potential increase in ease of access to the site. The number of bat mortalities may be undervalued. The effect of the felling to increase the wind farm's efficiency does not seem to have been fully assessed. A more structure cumulative effects section would be helpful with impacts and impact pathways clearly scoped in and out. Also, a more evidenced based assessment is required for cumulative effects. No mitigation is provided for the steep decline in Hen Harrier numbers.

Stakeholder concerns should be addressed within the chapter.

The potential impacts re decommissioning is not an unreasonable assessment however, additional survey effort and mitigation are required to ensure this result.

An overarching management and monitoring plan should be written, detailing the receptors, surveys, years of survey and management required over the years up to decommissioning, this should include but not be limited to:

- Consideration of the impact of greater access has had on turbary and other potential impacts such as hunting, recreation etc.
- There is no management or monitoring plan for habitats, it is recommended that habitats are managed to reach maximum positive condition and to plan for decommissioning to avoid degradation of the best habitats.
- There is no monitoring proposed for birds other than Hen Harrier, for which additional VPs should be added. Breeding and wintering bird surveys should also be undertaken.
- There is no monitoring proposed for amphibians or common lizard, it is recommended that some monitoring is undertaken to inform decommissioning.
- Bat monitoring using a suite of static detectors should be undertaken throughout the season to monitor the effect of the windfarm on bat foraging.
- Pre decommissioning otter surveys should be undertaken across the site and with appropriate buffers on the study area.

Additional mitigation or compensation should also be provided or considered for the following:

- Compensation for loss of habitat for red squirrel, pine marten, badger and nesting birds.
- No mitigation has been proposed for bats for the loss of coniferous forest as a roost and/or foraging resource, compensation should be provided. Two bat boxes for the potential loss of bridge roosting habitat do not seem sufficient. A minimum of three bat boxes should be erected either within each bridge or on suitable trees nearby.

Chapter 8 Aquatic Ecology and Fisheries

There is an extensive list of desk study data provided within section 8.1.3.2 however there is no listing of relevant legislation or policy. While some legislation is incorporated throughout the report a dedicated section should be provided. An assessment under the Water Framework Directive has not been undertaken nor one under the Eels Regulations. EPA guidelines (2017) are cited and followed; however it should also have included impact assessment guidance such as CIEEM guidelines 2019 (Ref 25). The NRA (2003) guidelines cited are not an appropriate assessment method.

The information is presented in a very academic way. Tabulation of each receptor baseline and valuation would help the reader navigate the large blocks of text. A separate survey methodology section separate from the baseline results would also help navigate the section.

Given the absence of any meaningful assessment of the freshwater systems prior to the start of construction, and given the admission in 'rEIAS, Section 8.1.4' that only limited data sources were identified by the current assessment for conditions preceding the peat slide of 2003, it is difficult to justify the concluding statement that despite constraints, it is considered that the data available, including the data collected during field surveys, is adequate.

The valuation of receptors is based on NRA guidelines from 2003, these were designed for roads and seem to refer largely to fisheries not to nature conservation status. These do not seem like an appropriate evaluation criterion, instead one should use impact assessment guidance such as CIEEM guidelines 2019

It would be appropriate to assess the faunal receptors fish and freshwater pearl mussel separately. There should be a section on the nature conservation status of each receptor and an appropriate evaluation of each one.

There are no stakeholder concerns presented within the document. Freshwater pearl mussel were a key stakeholder concern. These species appear to have been scoped out of the assessment but should be scoped out in a structured way with clear evidenced based reasoning.

The lack of any proposed monitoring is considered an omission in terms of proposed mitigation measures. Best practice guidance should be cited for mitigation. The formation of a management plan is welcome for the maintenance, this should also be overseen by an appointed pollution control officer. In addition to mitigation

for required maintenance, positive management and enhancement should be implemented. Yearly monitoring of the water courses should continue, annual monitoring of the site in general should be included to ensure that appropriate management is being undertaken. Method statements for the decommission should also be drawn up in advance. An assessment under the Water Framework Directive and under the Eels Regulations should be undertaken for the decommissioning even in the form of a pre-screening with recommendations for a detailed assessment to be undertaken prior to decommissioning.

The impacts may be underestimated, due to the lack of existing data. This is however difficult to judge and reliance on professional judgment is necessary. By incorporating the amendments and additions outlined in Sections 5.9.7. and 5.9.8 this would provide more confidence in the current and future impact predictions and in the success of mitigation.

Chapter 9 Landscape and Visual

The Landscape and Visual Assessment generally conforms to guidance and has been informed by several key guidance documents including Guidelines for Landscape and Visual Impact Assessment, 3rd Edition 2013 and Guide to Visual Representation of Wind Farms (Scottish Natural Heritage, 2017).

In principle, the assessment is appropriate and broadly follows the recommendations suggested in relevant Wind Farms guidance documents. However, the apparent absence of a scoping process and liaison with the competent authority departs from best practice as the scoping opinion represents the considered view of the competent authority and concerns of stakeholders on matters such as extent of study area, key receptors and viewpoints that would need to be assessed carefully.

Typically, as good practice the viewpoint locations would include a range of views to include various types of receptors such as residential, recreational, road users who would experience the landscape in different ways. In the assessment almost all views that have been selected are from roads which are transient in nature and even though the report mentions that there are a small number of rural houses on the fringes or outside of Derrybrien (to the south), Ballynakill (to the east) and along the local road to the south of the site, which do have views of the wind farm, these have not been included in the assessment.

There is also no mention of alternative siting/layouts considered and how/if landscape and visual issues have informed the layout and avoided visibility from certain locations.

The overall methodology is appropriate and while the guidance is not prescriptive there seems to introduction of an additional layer or effect which would make 'moderate effect' not significant. Moderate effects are generally significant and it is surprising that a very large wind far development of 70 turbines would not have a single significant effect.

No mitigation measures are proposed, and justification has been based on the absence of any significant effects. There is perhaps a missed opportunity to explore ways to assist the natural regeneration of the site following decommissioning given the fact that this is a very large wind farm development.

Chapter 10 Soils, Land and Geology

EU guidance in relation to the development of windfarms on peat-dominated landscapes is based on all-encompassing targets and does not therefore specify detailed processes by which these targets may be met. In the absence of specific guidance provided by the Irish authorities in relation to construction of windfarms on peat and the associated risk of slope failure, the rEIAR claims to use the detailed guidance provided by the Scottish Government – generally acknowledged as the best-practice guidance currently available and referred to here as SGG-2017. The rEIAR fails to follow this guidance in a number of key areas that are of critical importance given prevailing conditions at the Derrybrien windfarm site. The most evident failure to follow SGG-2017 is in the complete absence of any attempt to map the drainage pattern and the effect of this drainage on the afforested and formerly-forested peat body. Ample evidence, in some cases available for decades, exists to show that conifer plantations on peat bog systems causes substantial shrinkage of the peat, resulting in cracking and deformation of the peat matrix, particularly along the pattern of ploughing furrows. Evidence was presented in 2005 for the occurrence of this process at Derrybrien, and SGG-2017 specifically requires the mapping of such features. However, this mapping task, critical to the assessment of slope stability, has not been carried out either in the immediate post-slide surveys of 2004-5 or in the years since.

Furthermore, the site as a whole has not been subject to survey relevant to slope stability since 2005, so the 2020 slope stability assessment presented in the rEIAR is based on data which are at least 15 years old. The risk assessment, however, claims to show that conditions at the site have improved sufficiently by 2020 that areas identified as being at 'unacceptable risk' for the supposed 1998 'baseline' conditions are now at 'negligible risk'. This claim is not supported by any recent data. The claim is instead based on the generic idea that the drainage programme instigated in 2004 has increased the cohesive strength of the peat and thus reduced the risk of slope failure. Such a concept fails to recognise that, in peat, while drainage consolidates it also dislocates. Peat cracks are acknowledged by SGG-2017 and associated specialist literature as routes by which intense rainfall can be channelled to weak layers in the peat and thus trigger slope failure, but this is consistently ignored or not recognised within the rEIAR.

Indeed, the site mitigation strategy offered is simply one of continued drainage, worsening conditions in the long term, but claimed as the necessary means of preventing ponding of water on-site because such ponded water substantially increases the risk of slope failure. In a complete reversal of this strategy, however, the approach to decommissioning is that the drainage will no longer be maintained and will be allowed to choke up with vegetation resulting in ponded water, but the risk at this point is dismissed as being very slight.

Methods of survey used in 2004-5 for the site as a whole, and for the grid connection in 2017-19, do not conform to methods recommended in SGG-2017. This same failure to comply with the SGG-2017 guidance applies to the methodologies employed for constructing, analysing and presenting key aspects of the peat slide risk assessment.

The overall result of these failures to follow recognised guidance is that the rEIAR also fails to meet the relevant target requirements set out in the Checklist provided within the European Commission guidance for EIA (2017).

Chapter 11 Hydrology and Hydrogeology

Chapter 11 of the rEIAR provides a list of the legislation and best practice relevant to hydrology and the water environment. This list is comprehensive, however the assessment would benefit from a table summarising how the project achieves compliance with the key requirements of these laws and policies.

The rEIAR largely ignores the forested and formerly-forested blocks within the site in terms of hydrological mapping. Indeed, at a more general level, the rEIAR does not consider the issue of peat shrinkage due to drainage at all. As such, the rEIAR cannot be said to have followed the guidance (and associated specialist literature) which the rEIAR itself claims to be following.

There is no mapping of ploughing furrows, no mapping of peat cracks associated with such furrows, and very little attempt to map possible sub-surface piping associated with the forested ground – which represents a large proportion of the site. Given that the whole site, apart from the area of turbary, was afforested prior to windfarm development, failure to map diligently the hydrological effects and legacy of the forestry represents a major gap in the required set of baseline information.

The assessment methodology is suitably described and the significance criteria and adopted approach are consistent with what is documented in Chapter 1. However, the assessment would benefit from a table to summarise key receptors and their attributes, the value assigned to each and the rationale behind the values assigned.

The Chapter does not provide any details with regard to stakeholder engagement and no reporting of any concerns raised by stakeholders is included. The South Galway Flood Relief Committee submitted a complaint to the EC detailing how they attempted to contribute to the rEIAR but were ignored by the developer. The only communication they received in response to the letter sent to the developer in April 2017 was in a notice on 2 September stating that a rEIAR has been submitted to An Bord Pleanala.

The Chapter includes an assessment of the effects of decommissioning the wind farm. The assessment records which elements of the windfarm infrastructure would be removed, and which would be left in-situ. A key element for consideration is the land drainage system installed to prevent ponding on site during operation of the windfarm, with the proposal to leave this system in place with no future maintenance. The assessment acknowledges that over time, drainage channels would be expected to reduce in capacity due to vegetation growth and silting and effects on the hydrological regime and are stated as the temporary, localised and minor negative.

There is apparent conflict between the mitigation approaches applied during operation, when a drainage system is actively maintained to move rainfall runoff off site and prevent surface water ponding, and during decommissioning, when this drainage system would be allowed to degrade, without any ongoing maintenance.

Given that the proposed mitigating measures have the potential to increase risk over time, a Contingency Plan and physical measures to limit impact would appear to merit priority action. A record of stakeholder engagement should be provided and responses to the issues raised by the South Galway Flood Relief Committee should be provided.

Considering the issues raised by the South Galway Flood Relief Committee, and the concerns reported in Soils, Land and Geology review with regard to the conclusions of the assessments linked to the peat hydrology of the site, without further evidence, some conclusions of the hydrology and hydrogeology assessment cannot be considered reasonable. In particular, there is need for further justification of the assessed local and minor effects of windfarm decommissioning on the catchments hydrological regime.

Chapter 12 Air and Climate

The air quality assessment confirms to the most appropriate guidance for the assessment of this type of project. The conclusions of the chapter are reasonable and the impacts on local air quality reported as not significant are accepted. The mitigation measures included in the chapter in relation to the control of construction activities are in line with best practice.

In terms of the assessed balance of carbon emissions for the lifetime of the windfarm (and beyond) the rEIAR uses the Scottish Government Carbon Calculator for windfarm developments on peat, but only provides total net carbon values for each entire module within the calculator. The absence of individual values fed into each question within the Carbon Calculator makes it impossible to judge the validity of the overall values presented. A full set of input values should have been provided, together with an explanation of each value used. These input values and their justification could have been provided within an Appendix.

Chapter 13 Material Assets

The term 'material assets' has a broad scope, which may include assets of human or natural origin, valued for socio-economic or heritage reasons. Chapter 13 sets out the justification for material assets not considered in detail but it is not clear whether any consultation has been undertaken as part of this scoping out process. Although there are omissions in terms of defining the study area and sources of data, the baseline information is appropriate, taking into consideration the extent of cross-referencing in the Chapter.

The Chapter does not provide information to inform the description of effects where this would have been expected. For example, during construction the Chapter states that large areas of forest plantation have been felled to accommodate the wind farm and grid connection but the areas affected are not given until the mitigation section. It should also be noted that throughout the rEIAR different figures are stated with respect to the area of forestry felled.

The assessment methodology broadly follows the criteria set out in the EPA Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017), although it is unclear how the classification of significance set out has been applied. The conclusions however seem on the whole reasonable, although the conclusion that felling of forestry on the wind farm site prior to construction is a neutral effect is questionable. Notwithstanding the above, it is considered unlikely that any remedial works for the existing operation of the wind farm would be required. Confirmation that replacement planting for forestry felled was undertaken should be sought. Consultation with Coillte regarding their felling plans in the future is also recommended. In addition to mitigation measures proposed, during decommissioning the contractor could be required to be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider.

Chapter 14 Traffic and Transport

Chapter 14 examines the impact of the development with respect to Traffic and Transport. It is not made clear how the study area or method of the Chapter have been derived. No scoping appears to have been undertaken with the competent authority or its consultees. The environmental sensitivity of geographical areas within the study area has not been defined.

Baseline information, namely traffic flows, is not given for several roads within the study area. The EIA Directive requires that a description is given of the current state of the environment. With regards to traffic and transport, the existing environment is a direct function of existing traffic flows and therefore the magnitude of impacts should be calculated from the relative change compared with the quantified baseline.

The Chapter does not set out the method for establishing the existing environmental sensitivity of geographical areas within the study area, nor does it set out a transparent method for establishing the magnitude of impacts. In the absence of either, it is not possible to validate the assessment of the significance of effects.

During decommissioning, mitigation is proposed in the form of moving abnormal loads at night and implementing a Traffic Management Plan. Given that the findings of the significance effects cannot be corroborated, the appropriateness and effectiveness of the proposed mitigation measures cannot be commented upon.

Additional information and evidence is required to understand whether there would be any significant traffic and transport effects resulting from the decommissioning of the project. Given the deficiencies in the assessment, it cannot be considered that the conclusions of the Chapter are reasonable, and it cannot be concluded that any residual effects would be Not Significant.

Chapter 15 Cultural Heritage

The Chapter generally conforms to guidance however there are some areas where the assessment could have been more comprehensive. Although archaeological monitoring of ground works was carried out during the first phase of construction of the wind farm, the report on these works could not be sourced. The authors sought to resolve this through obtaining written confirmation from the archaeologist that conducted the investigations that nothing of archaeological significance was revealed in any area of the site. Overall the desk-based sources consulted are comprehensive and appropriate. The lack of a report detailing monitoring does represent a gap in the record.

The windfarm site is located in an area of upland peat bog. Peat and peat bogs are well known to provide excellent preservation of organic remains and can be a fantastic source of paleo-environmental evidence. The chapter does not acknowledge this potential.

The Chapter focuses on the lack of known cultural heritage assets within the areas of proposed activity. It is silent on the prospect of previously unrecorded assets being impacted by decommissioning activities (in particular the land regrading) and does not consider the possibility of decommissioning activities presenting an opportunity to carry out investigations into the potential for archaeological preservation within the peat deposits.

Some mitigation measures in the form of archaeological monitoring are being proposed. The effectiveness of these measures will depend on their exact scope and nature – assessment and monitoring that acknowledges and accounts for the potential for as yet unrecorded remains to be present, particularly within the peat deposits, will be more effective than assessment and monitoring that focuses solely on known heritage assets. It would also be helpful for the scope of the proposed archaeological assessment and monitoring to be clarified and for that scope to appropriately consider the archaeological potential of the peat.

Chapter 16 Major Accidents and Disasters

The Chapter provides a description of the social, natural hazards, infrastructure and hazardous sites and provides a detailed account of the 2003 peat slide. References is made to investigations undertaken to identify the cause of the land slide. The baseline however lacks a detailed review of the baseline conditions prior to the land slide.

Although the methodology clearly sets out how risks have been evaluated using an Emergency Risk Rating Matrix, no link is made between the risk ratings and 'Significance of Effect' in terms of the EIA Directive.

There is no evidence within the Chapter of any response to stakeholder concerns. This is a major omission given the significant concerns stakeholders have following the peat slide in 2003 where public roads and bridges were inaccessible for long periods of time and watercourses were blocked with peat. Recently the developer has placed a Hazard sign at the entrance to the turbary stating that there is a risk of instability if peat cutting activities are undertaken. This prevents the local residents from obtaining a fuel supply for use

next winter but has also heightened concerns about site stability, despite continued assurances from the developer (and repeated in the rEIAR) that mitigation measures have rendered the site safe.

No evidence is presented to demonstrate that the decommissioning phase would not increase the risk of a further peat slide. The rEIAR simply states that operation phase will continue to reduce the risk due to the drainage improvement and sustained loading of the peat from the constructed infrastructure. However, the rEIAR states that the drainage structures would not be maintained following decommissioning and would likely become obstructed by debris. It is incongruous to state on one hand state that maintenance of a robust drainage system is vital for site stability but that following decommissioning maintenance will stop and permit the drainage system to fail having undertaken no mitigating management to stabilise such a future scenario. There is also no consideration of projected impacts of climate change and the implications this may have for peat stability resulting from periods of drought and/or heavy rainfall.

The likelihood of a peat slide during decommissioning is considered to be very unlikely in the rEIAR. Without sufficient evidence to substantiate this claim, this conclusion is unreasonable. Further evidence is required to demonstrate that following decommissioning the risk of a peat slide will not increase. Either a long term maintenance plan following decommissioning should also be implemented or works to restore the peat to a point where long term maintenance is not required should be considered.

Chapter 17 Interaction of Impacts

Effects and their significance are described sporadically throughout the chapter without consistent use of the impact characteristics and the degree / nature of the effect. The assessments are high level and do not provide sufficient detail to justify conclusions, although it is noted that reference is made to other chapters where further information is provided.

In terms of intra project cumulative impacts, the report states that these are considered in the technical chapters. However, a methodology for identifying other projects with the potential for cumulative effects and a list of these other committed developments is not provided. The assessment methodology would benefit from a description of how individual effects are combined to determine a resulting effect significance. The assessment presents effects identified in the technical chapters with the potential cumulative effects but does not include an assessment to properly consider how these effects may interact to result in a potentially more significant residual effect.

No mitigation measures are proposed. For the most part this is acceptable as the assessment does not report any significant cumulative effects that require mitigation. However the rEIAR identifies minor, negative temporary impacts that rely on the road widening activities being 'properly planned and supervised'. Further details should be provided.

The assessment excludes cumulative tree felling impacts stating that "*only the impact of felling associated with the wind farm project was considered and any other felling carried out in the area during construction and following commissioning is beyond the study scope*". Given that the project involved the felling of some 222ha of forest, this is considered to be a major omission from the assessment.

The South Galway Flood Relief Committee have raised concern that the cumulative effects of forestry felling and operations have not been considered in the rEIAR. An assessment of the cumulative tree felling at the site and in the surrounding area should be undertaken.

18 Summary of Remedial Measures

The chapter provides a useful summary of all the remedial measures identified in the technical chapters setting out their duration, stage of impact and status. The presentation of the measures is comprehensive. Comments on measures proposed are set out in each of the relevant topic chapters of this report.

Conclusions

In terms of scope, the rEIAR satisfies most of the content requirements of the EIA Directive as set out in Articles 3 and 5. The exception is the requirement to estimate quantities and types of waste (Annex IV). The rEIAR only provides a short passage of text setting out that all demolition waste will be removed from site and reused

/ recycled where possible. Considering the scale of the decommissioning activities (i.e., removal of 70 turbines), this is a major omission and renders the rEIAR non-compliant with the EIA Directive.

In accordance with the EIA Directive, a five-week participation window was provided for public consultation. While this meets the minimum requirements of the EIA Directive, there is a question mark over the effectiveness of participation enabled by this opportunity, given the complex nature of the topic and the volume of application documents. The rEIAR states that the public have been engaged throughout the process, but this is contradicted by all of the complaints received by the EC.

The assessment methodology for the rEIAR is clearly set out in the introductory chapters and supplemented by chapter specific methodologies and effect significance criteria. However, inadequacies have been identified in the methodologies for the Population and Human Health; Terrestrial Biodiversity; Landscape and Visual; Traffic and Transport; Soils, Land and Geology; Material Assets and Interaction of Impacts. Inadequacies include invalid survey methods and not applying the stated significance criteria within the assessments. These inadequacies invalidate the conclusions of some assessments, and the appropriateness and effectiveness of the proposed mitigation measures cannot subsequently always be determined.

Aside from the issues with the assessment methodology, the most fundamental inadequacy of the assessment is the handling of the risk of further peat slides following decommissioning. The operational assessment relies heavily on the continued functioning of the drainage system during operation to mitigate the risk. However, the report makes clear that following decommissioning there will be no further action even though the drainage system will become blocked and lead to pooling on the peat thereby increasing the risk of another peat slide.

It is recommended that further information is provided before the consenting authority can make an informed decision on this application. Inadequacies have been identified within the assessments which lead to uncertainty around the validity of the conclusions and the suitability and effectiveness of proposed mitigation. Most importantly, more evidence is required to demonstrate that following decommissioning the site will be returned to a state in which there is not an unacceptable risk of further peat slides with associated adverse effects on hydrology, ecology, and human health.

1 Introduction

1.1 Background

In the context of a global framework contract for carrying out technical assessments with regard to potential infringements of the EU environmental legislation, ARCADIS was commissioned to carry out a technical assessment with the purpose of establishing whether there is a potential infringement of EU law associated with the Derrybrien Wind Farm Project, County Galway, Republic of Ireland.

1.2 Background to Derrybrien Wind Farm

The operational Derrybrien Wind Farm Project is located in the northern part of the Slieve Aughty Mountains in County Galway, approximately 11km south of Loughrea, 13km north east of Gort and 24km west of Portumna.

The Project comprises 70 No. Vestas V52-850 kW wind turbines and substation, a grid connection comprising an overhead line (approximately 7.8km long) and Agannygal Substation connecting the wind farm to the National Grid and all associated developments. The owner and operator of the wind farm is Gort Windfarms Limited, a subsidiary of the Electricity Supply Board (ESB).

Derrybrien Wind Farm was acquired by Gort Windfarms Ltd. from a private developer (Saorgus Energy Ltd.) in 2003. At the time of acquisition, the majority of the project site was in use as commercial forestry with some turf cutting undertaken in non-forested areas located to the north and east of the site. Development consents were in place in the form of a number of planning permissions obtained between 1998 and 2002, permitting the development of a 71 No. turbine wind farm which would be connected to the national grid by means of an overhead line. The planning applications were originally made to Galway County Council and the three planning applications associated with the wind farm were granted on appeal by An Bórd Pleanála.

Although the development consent was for 71 No. turbines, the access track between T15 and T17, which provided access to the proposed Turbine 16, was abandoned as being incapable of stabilising satisfactorily (few details are provided about this decision). With no access to the location of Turbine 16 there was no way it could be constructed, although an un-made track is evident on satellite imagery.

Construction of the wind farm commenced in June 2003 and continued to 2006. In October 2003, during the excavation work for turbine base T68, a peat slide occurred immediately south of the turbine foundation location. The slide which was within the wind farm site boundary to the south of the site caused the disturbance and partial displacement of peat and forest debris mainly onto land between the wind farm site and Flaggy Bridge on the R353. Displaced peat remobilised following a period of heavy rain. During the peat slide, debris passed down a stream valley and into an area of open flatter ground where it lost momentum and was deposited upstream of a minor road bridge (the Black Road Bridge). Some peat was transported further down the Owendalulleagh River with small amounts of peat deposited along the river banks. The estimated volume of peat in the peat slide area, based on the extent of the peat slide area was 450,000m^3 dispersed over a wide area.

The following year (2004), construction of the wind farm resumed. All phases of the project were constructed in parallel. Construction of the Project was completed in 2006. The wind farm has been in continuous operation since 2006 and the operator envisages that it will operate until circa 2040, at which time it will be decommissioned.

In 2008, the Court of Justice of the European Union (CJEU) delivered a judgment against the State concluding that Ireland had failed in its obligations to assess environmental effects in accordance with European Directives prior to granting of the planning permissions for the Derrybrien wind farm.

In 2019, there was a further CJEU judgment against the State for failure to comply with the 2008 judgment.

In order to facilitate compliance by the State with the CJEU judgments, Galway County Council has served a Notice under the Planning and Development Acts directing Gort Windfarms Limited to submit an application for Substitute Consent to An Bord Pleanála. The remedial Environmental Impact

Assessment (EIA) process started on 21 August 2020 when the developer submitted a substitute consent application to An Bord Pleanala. The Application includes environmental assessments which are intended to demonstrate compliance with the EIA Directive (Ref 1) and Habitats Directive (Ref 2), which will assist An Bord Pleanála carrying out a full environmental assessment of the Derrybrien Wind Farm Project throughout the construction, operational and decommissioning stages. These assessments also address all the works that were undertaken in response to the peat slide in 2003.

Concerns have however been raised by local complainants that the process is not adhering to the EIA Directive requirements and that key issues of concern are not being addressed.

1.3 Derrybrien Wind Farm Project Description

The remedial EIA Report (rEIAR) states that the closest settlement to the wind farm is the village of Derrybrien some 2km to the south. The village of Peterswell is approximately 7.5km to the west. The nearest occupied houses are located approximately 2km from the boundary of the site. A derelict house is located some 1.3km from the boundary of the site. It is understood that this has not been occupied since before the peat slide.

The wind farm occupies a relatively small portion of a larger Coillte site. The site is covered by forestry plantation and blanket peat. Coillte manage commercial forestry operations over the broader site. Some turbary activity takes place in the area.

The key elements of the Derrybrien Wind Farm comprise:

- Turbines and associated development - 70 No. Vestas V52-850 kW turbines and associated ancillary development.
- Underground cables – from each turbine, buried at shallow depth, to electrical transformers in Derrybrien Substation where the electricity is transformed to a higher voltage for supply to the national electricity network via the Derrybrien – Agannygal Overhead Line (OHL).
- Anemometer masts – two lattice masts.
- Access roads – Access to the wind farm site was facilitated by the upgrading of an existing Coillte forestry road which connected to the Black Road to the east of the site. There is a network of wind farm access tracks across the site. These comprise sections of pre-existing forestry tracks, and roads specifically developed during the construction of the wind farm.
- Borrow pits - Borrow pits were excavated on the site – with the extracted material used for the construction of access tracks and hard standing areas.
- Peat excavation and storage - To facilitate the development of the wind farm, peat was excavated from locations including the turbine foundations, hardstanding areas and the footprint of the substation.
- On-site storage - Spare turbine parts are stored in a number of modular storage containers located on the wind farm site.
- On-site drainage - Across the site there is a network of drainage channels. These comprise a mixture of pre-existing and constructed channels which facilitate the discharge of surface waters to watercourses.
- Electrical Substations and the grid connection - Underground cables from across the site converge at Derrybrien Substation where the electricity is transformed from 20kV to 110kV. The electricity is exported via an overhead line extending from the wind farm to Agannygal Substation from where it is exported to the national grid via a pre-existing overhead line.
- Tree felling – Commercial forestry was felled to facilitate the construction of the wind farm. Operational requirements of the wind farm necessitate the licensed felling of trees. Approximately 220 Ha of forestry were felled to facilitate the construction of the wind farm.
- Operational requirements necessitated the licensed felling of an additional c.47 Ha of forestry between 2016 and 2018
- Improvements on the local road network – sections of local roads and carriageways (include bridges on the Black Road) were upgraded.

- Engineering works associated with the historic peat slide - The peat slide that occurred during construction caused the disturbance and partial displacement of peat and forest debris onto land south of the wind farm site. Displaced peat remobilised following a period of heavy rain. Following the peat slide, emergency measures were implemented. Stabilisation and containment works were installed both inside and outside the wind farm site and other works were carried out to prevent further propagation of the peat slide and to prevent further release of debris into watercourses downstream (installation of earthen and boulder barrages to minimise effects on receiving watercourses, roads and lands). Some of these features were temporary and some – including barrages and repositories, remain today. Further works associated with the peat slide were undertaken in 2004- 2005 which comprised the creation of offsite peat repository areas for the storage of displaced peat. The location of works associated with the peat slide are mainly located within the townland of Derrybrien North. The affected lands are principally owned by Coillte with some private landowners also affected.

2 Description of the Case

In July 2008, the Court of Justice of the European Union (CJEU) delivered a judgment against the Irish State in Commission v Ireland (C-215/06, EU:C:2008:380) referencing Derrybrien Wind Farm (Ref 3).

In its judgment of 3 July 2008, the Court held that, by failing to adopt all measures necessary to ensure that:

- projects which are within the scope of Directive 85/337 (Ref 4), either before or after amendment by Directive 97/11 (Ref 5) are, before they are executed in whole or in part, first, considered with regard to the need for an environmental impact assessment and, secondly, where those projects are likely to have significant effects on the environment by virtue of their nature, size or location, that they are made subject to an assessment with regard to their effects in accordance with Articles 5 to 10 of Directive 85/337, and
- the development consents given for, and the execution of, wind farm developments and associated works at Derrybrien, County Galway (Ireland), were preceded by an assessment with regard to their environmental effects, in accordance with Articles 5 to 10 of that directive,

Ireland failed to fulfil its obligations under Articles 2, 4 and 5 to 10 of Directive 85/337.

The scope of works referenced in that Judgement comprised the wind farm and ancillary aspects of the project including inter alia road construction, felling of forestry, peat extraction, quarrying and electricity transmission.

A further judgment of the Court of Justice of the European Union (CJEU) in Case C-261/18 on 12 November 2019 (Ref 6), found that the Irish State had failed to take measures necessary to comply with Case C-215/06 and to fulfil a number of obligations arising from the EIA Directive (at the time Directive 85/337 as amended by Directive 97/11). The judgement issued under Case C-261/18 requires the State to take measures to comply with the earlier judgement i.e., to take steps to ensure that projects are subject of robust EIA.

The CJEU judgements have determined that the permission(s) which enabled the development of this Project were in breach of law, invalid or otherwise defective because though the EIA report (the EIS) complied with Irish legislation at that time, it was inadequate because the Irish State had failed to fulfil a number of obligations arising from the EIA Directive.

As a result of the November 2019 judgement, Galway County Council initiated the Substitute Consent process under the Planning and Development Act, 2000 (as amended) (referred hereafter as the PDA) (Ref 7).

Section 177B (1) of Part XA of the PDA requires that where a planning permission for a project requiring an EIA has been found defective in a material respect by a court of competent jurisdiction in the State or the European Court of Justice, the planning authority must give notice in writing to the developer or other appropriate person directing that an application for substitute consent be made to An Bórd Pleanála (the Board) no later than 12 weeks from the date of the notice and that the application for substitute consent is to be accompanied by a rEIAR or remedial Natura Impact Statement (rNIS) or both as the case may be.

On 9 June 2020, the Planning Authority - Galway County Council, issued a notice to Gort Windfarms Ltd. pursuant to Section 177B of the PDA. That Notice stated that:

- the Planning Authority has become aware in relation to development within the Council's administrative area for which several permissions were granted by the Council and / or An Bord Pleanála and for which an EIA was required;
- a final judgement of the Court of Justice of the European Union in the case of Commission of the European Communities -v- Ireland (case C-215/06) had been made on the 3 July 2008 and that permissions listed, 'or certain of same', were in breach of law, invalid and/or otherwise defective for the reasons set out in the said Judgement and in particular were in

breach of the provisions of European Directive 85/337/EEC (and as amended by European Directive 97/11) by reason of the omission from the application for permission of an Environmental Impact Statement in respect of those parts of the development for which permission was granted without an Environmental Impact Statement having been submitted;

- Gort Windfarms Limited was the person who carried out the development and/or the owner and occupier of the land on which the development is situated.

The Notice directed Gort Windfarms Limited to apply to The Board for substitute consent, within the meaning assigned by the PDA, as amended, in respect of 'the Development', no later than 12 weeks from the date of the Notice. It further directed Gort Windfarms Limited to furnish with that application, a rEIAR) and - if required, a rNIS.

The Notice, per Schedule 1, described 'the Development' as 'the development of a windfarm, including ancillary development which includes service roadways, control house, transformer compounds and anemometer mast at Derrybrien West, Derrybrien East, Derrybrien North, Toormacnevin, Bohaboy, Caheranearl and Boleyneendorrish, in the County of Galway'.

The Notice issued was confirmed by Galway County Council on 23 July 2020.

The Commission was informed that the remedial EIA process had commenced on 21 August 2020 when the developer submitted a substitute consent application to An Bord Pleanala. The application comprised a number of documents including a rEIAR and rNIS. A provisional date of 4 January 2021 for the determination was targeted. Concerns have however been raised by local complainants that the process is not adhering to the EIA Directive requirements and that key issues of concern are not being addressed.

Furthermore, the legal delivery vehicle for this remedial EIA in Irish law, the substitute consent process, has been called into question by the Irish Supreme Court in a recent judgment of 1 July 2020 in An Taisce v. An Bord Pleanala (Ref 8).

New legislation has now been adopted in Ireland to respond to the concerns raised by the Supreme Court. The Commission has been informed by the Irish authorities that the developer will not need to resubmit the application, but the original decision deadline of 4 January 2021 will now be extended.

2.1 Background to the Technical Assessment

This report comprises an analysis of the documentation and process supporting the rEIAR of Derrybrien Wind Farm and ancillary works. The documentation reviewed includes the rEIAR, rNIS and information provided by third parties commenting on this process (which are publicly available) as well as documentation from complainants submitted to DG Environment (see Appendix B for a full list of the complaints and documents reviewed).

The objective has been to identify whether the remedial EIA process being undertaken is thorough, complete and in line with EU law. This report therefore comprises technical assessment of the information submitted and also assess the documentation provided as the basis for the remedial EIA process, as well as the process itself inter alia, in terms of public participation.

The overall objective has been to assess if the EIA remedial process has fairly assessed the key impacts over time and addressed appropriately the need for remediation and compensation measures.

Account has been taken not only of the situation as it was when the Project was originally consented, but also the impacts of the Project whilst being built, the impacts during its lifetime as well as the impacts when the Project is decommissioned.

The focus of this report is on the main impacts of concern related to this Project from its construction, operation to decommissioning. Due to the historic peat slide that occurred, peat stability has been a key focus of this assessment. Given the location of the wind farm on high ground with peat soils, the interaction between this development and the surrounding land uses, in particular, with regard to water runoff and possible downstream pollution and flooding has also been considered as a key issue. Assessment of likely impacts of the development on protected habitats and species are also an important area of focus in the review.

The reasonableness of the conclusions reached by the developer's rEIAR (and accompanying documentation) and the final decision maker, have been assessed, in particular with regard to the need for possible remediation works.

This report considers if all possible remediation options have been assessed, including where necessary the removal of one or more parts of the development. This assessment also considers whether any additional information may need to be provided in the process e.g. on the request of the decision maker within the overall EIA process. The assessment is then measured against the final decision of An Bord Pleanala.

The structure of this report is as follows:

Section 2 Description of the Case

Section 3 Methodology for the Technical Assessment

Section 4 Compliance with European Union Environmental Legislation

Section 5 Remedial Environmental Impact Assessment Report Review

Section 6 Conclusions

Section 7 List of Sources Consulted

3 Methodology for the Technical Assessment

3.1 Team of Experts

The team consists of a set of experts, covering the different environmental disciplines of an EIA. The core team includes technical experts in relation to peat/ soil stability, hydrology and flood risk and protected habitats and species. The core team consists of:

- [redacted]: senior EIA expert (Arcadis)
- [redacted]: senior biodiversity expert (Arcadis)
- [redacted]: senior peatland expert (sub-consultant)
- [redacted]: senior hydrologist and flood risk expert (Arcadis)

3.2 Methodology and Approach

The following information from the dossier was provided by the Commission:

- Derrybrien Wind Farm Project rEIAR
- Derrybrien Wind Farm Project rNIS
- Documentation in relation to complaints and concerns raised by stakeholders in response to the rEIAR (See Appendix B for a list of complaints)

The review has comprised technical review of the documentation by experts. In conducting the review, every effort has been made to remain independent, objective and systematic.

The available information has been assessed from a mainly technical point of view. The documents provided by the EC were analysed taking into consideration the requirements of the relevant EU legislation and the ECJ judgements. However, it should be stressed that this assessment is mainly of technical nature and does not provide for an exhaustive legal assessment taking into account all relevant EU legislation and judgements of the ECJ.

A detailed chapter-by-chapter review of the rEIAR and information provided as stated above has been undertaken. The review has included:

- Assessment of compliance of ES with relevant legislation and best practice;
- Consideration of the adequacy of baseline information
- Consideration of the appropriateness of the assessment methodology and significance criteria, and whether these has been applied correctly;
- Consideration if stakeholder concerns have been addressed;
- Effect of Decommissioning
- Consideration of the likely effectiveness of the proposed mitigation measures;
- Recommendations for any further mitigation measures that could be necessary; and
- Identifying if additional information or evidence should be requested from the applicant.
- Reasonableness of Conclusions and Need for Possible Remedial Works

Each technical assessment considers whether the national competent authorities, when issuing the decisions authorizing the project had ensured the proper application of the EIA and HRA Directives.

The review has followed the Guidance on EIA: EIS Review, EC / Environmental Resources Management (Ref 9). Although this guidance was designed primarily for use by competent authorities in assessing the adequacy of an ES, the EC Review Checklist is a systematic method for reviewing the adequacy of the ES in terms of compliance with the requirements of the Directive and accepted good practice in EIA. The completed EC Review Checklist is included in Appendix A.

4 Compliance with European Union and Irish Environmental Legislation and Process

4.1 EIA Directive

The current EIA Directive is Directive 2011/92/EU as amended by Directive 2014/52/EU. The rEIAR correctly references this version of the EIA Directive. The following Articles of the EIA Directive are considered to be of relevance to this technical assessment. These requirements have been incorporated into the ES Review Checklist contained in Appendix 1 of this report, which has been used to aid this technical assessment.

Article 2 of the EIA Directive requires Member States to adopt 'all measures necessary to ensure that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment. These projects are defined in Article 4'.

Article 3 of the Directive provides that:

1. 'The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on the following factors:
   a. population and human health;
   b. biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
   c. land, soil, water, air and climate;
   d. material assets, cultural heritage and the landscape;
   e. the interaction between the factors referred to in points (a) to (d).
2. The effects referred to in paragraph 1 on the factors set out therein shall include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned.'

These factors are included in the rEIAR (as shown in Table 5-1 below). The adequacy of the assessments are considered further in Sections 5.2 – 5.19 of this report.

Article 5 (1) states that 'Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report. The information to be provided by the developer shall include at least:

f. a description of the project comprising information on the site, design, size and other relevant features of the project;
g. a description of the likely significant effects of the project on the environment;
h. a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;
i. a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment;
j. a non-technical summary of the information referred to in points (a) to (d); and
k. any additional information specified in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected.

Annex IV provides more detailed requirements for the required content of the rEIAR. These requirements have been considered in assessing compliance of the rEIAR against the EIA Directive.

Table 4-1 Annex IV Information referred to in Article 5(1)

Section	Information for the Impact Assessment Report
1	Description of the project, including in particular: a. a description of the location of the project b. a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; c. a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used d. an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases.
2	A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.
3	A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.
4	A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.
5	A description of the likely significant effects of the project on the environment resulting from, inter alia: a. the construction and existence of the project, including, where relevant, demolition works; b. the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; c. the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; d. the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); e. the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; f. the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; g. the technologies and the substances used The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.

Section	Information for the Impact Assessment Report
6	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.
7	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.
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.
9	A non-technical summary of the information provided under points 1 to 8.
10	A reference list detailing the sources used for the descriptions and assessments included in the report.

Consideration is given to whether the requirements of Annex IV are met in Sections 5.2 – 5.19 of this report. This follows the format of the rEIAR. It should however be noted that the rEIAR addresses the disposal and recovery of waste within the description of the project (in accordance with Annex IV Section 1) however the types and quantities of waste are not detailed and there is no attempt to consider the likely significant effects of the project on the environment resulting from the disposal and recovery of waste (in accordance with Annex IV, Section 5).

4.2 Scoping

With regards to EIA Scoping, Article 5 states that 'where an opinion is issued pursuant to paragraph 2, the environmental impact assessment report shall be based on that opinion, and include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment. The developer shall, with a view to avoiding duplication of assessments, take into account the available results of other relevant assessments under Union or national legislation, in preparing the environmental impact assessment report'.

No EIA Scoping has been undertaken to inform the rEIAR. This is considered further in Section 5.2 of this report.

4.3 Competent Experts

Article 5(3) of the EIA Directive requires that in order to ensure the completeness and quality of the environmental impact assessment report *'the developer shall ensure that the environmental impact assessment report is prepared by competent experts'.*

Compliance against Article 5(3) is considered in Section 5.2 of this report.

4.4 Public Consultation

Article 6 of the EIA Directive focuses on public consultation, in particular:

1. Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences are given an opportunity to express their opinion on the information supplied by the developer and on the request for development consent, taking into account, where appropriate, the cases referred to in Article 8a(3). To that end, Member States shall designate the authorities to be consulted, either in general terms or on a case-by-case basis. The information gathered pursuant to Article 5 shall be forwarded to those authorities. Detailed arrangements for consultation shall be laid down by the Member States.
2. In order to ensure the effective participation of the public concerned in the decision-making procedures, the public shall be informed electronically and by public notices or by other appropriate means, of the following matters early in the environmental decision making procedures referred to in Article 2(2) and, at the latest, as soon as information can reasonably be provided:
   a. the request for development consent;
   b. the fact that the project is subject to an environmental impact assessment procedure and, where relevant, the fact that Article 7 applies;
   c. details of the competent authorities responsible for taking the decision, those from which relevant information can be obtained, those to which comments or questions can be submitted, and details of the time schedule for transmitting comments or questions;
   d. the nature of possible decisions or, where there is one, the draft decision;
   e. an indication of the availability of the information gathered pursuant to Article 5;
   f. an indication of the times and places at which, and the means by which, the relevant information will be made available;
   g. details of the arrangements for public participation made pursuant to paragraph 5 of this Article.
3. Member States shall ensure that, within reasonable time-frames, the following is made available to the public concerned:
   a. any information gathered pursuant to Article 5;
   b. in accordance with national legislation, the main reports and advice issued to the competent authority or authorities at the time when the public concerned is informed in accordance with paragraph 2 of this Article;
   c. in accordance with the provisions of Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information (1), information other than that referred to in paragraph 2 of this Article which is relevant for the decision in accordance with Article 8 of this Directive and which only becomes available after the time the public concerned was informed in accordance with paragraph 2 of this Article.
4. The public concerned shall be given early and effective opportunities to participate in the environmental decision-making procedures referred to in Article 2(2) and shall, for that purpose, be entitled to express comments and opinions when all options are open to the competent authority or authorities before the decision on the request for development consent is taken.
5. The detailed arrangements for informing the public, for example by bill posting within a certain radius or publication in local newspapers, and for consulting the public concerned, for example by written submissions or by way of a public inquiry, shall be determined by the Member States. Member States shall take the necessary measures to ensure that the relevant information is electronically accessible to the public, through at least a central portal or easily accessible points of access, at the appropriate administrative level.
6. Reasonable time-frames for the different phases shall be provided for, allowing sufficient time for:
   a. informing the authorities referred to in paragraph 1 and the public; and

b. the authorities referred to in paragraph 1 and the public concerned to prepare and participate effectively in the environmental decision making, subject to the provisions of this Article.

7. The time-frames for consulting the public concerned on the environmental impact assessment report referred to in Article 5(1) shall not be shorter than 30 days'.

Under Article 8 of the EIA Directive 'the results of consultations and the information gathered pursuant to Articles 5 to 7 shall be duly taken into account in the development consent procedure.'

The Supreme Court Ruling Record 1st July 2020 between An Taisce and An Bord Pleanála considers public participation rights under EU Law and refers to Article 6(4) of the EIA Directive around *'early and effective opportunities to participate in the environmental decision-making procedures referred to in Article 2(2)'*. The ruling record notes the following from the EIA Directive (2011/92/EU) – *'effective public participation in the taking of decisions enables the public to express, and the decision-maker to take account of, opinions and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision-making process and contributing to public awareness of environmental issues and support for the decisions taken'*. Conclusions from the Supreme Court states that *'given the structure of s. 177, the failure to make provision for public participation at the leave application stage for substitute consent is inconsistent with the public participation rights conferred by and outlined in the EIA Directive.'* In not enabling public engagement at a stage when effective participation can take place, there is reduced potential for the detail within the application to be informed by local information.

A five-week participation window was provided for public consultation on the rEIAR. Whilst there has been an opportunity for public participation to take place, there is a question mark over the effectiveness of participation enabled by this opportunity, given the complex nature of the topic, the volume of application documents and the reasonableness of the timeframe for comments / inputs by members of the public.

Section 1.5.5. of the NTS states "Gort Wind Farms Limited has engaged with the general public in relation to the Derrybrien Wind Farm Project throughout the development and operation of the Project." All of the complaints received by the EC contradict this claim.

A complaint was made by a local resident that although there was a 30-day public consultation period starting on 21 August 2020, the documentation was not accessible until 27 August 2020.

4.5 Planning and Development Act, 2000

The requirements of the EIA Directive are transposed into Irish legislation by means of Part X of the PDA. The rEIAR refers to this legislation in Section 1.1.4. This legislation sets out when the requirement for EIA arises; provides a definition of terms; states the requirements of the EIAR itself; and the process by which assessment process is completed and decisions are made.

As a result of the retrospective element of the assessment, the rEIAR differs from a normal EIAR in that it is required to identify significant environmental impacts which have already occurred together with ongoing impacts as well as future likely impacts as would be required in an EIAR. Specifically, as set out in section 177F(1) of the PDA 2000 (as amended) the rEIAR is required to provide the following:

a. a statement of the significant effects, if any, on the environment, which have occurred or which are occurring or which can reasonably be expected to occur because of the development the subject of the application for substitute consent was carried out;

b. details of—

i. any appropriate remedial measures undertaken or proposed to be undertaken by the applicant for substitute consent to remedy any significant adverse effects on the environment;

ii. the period of time within which any proposed remedial measures shall be carried out by or on behalf of the applicant;

c. such information as may be prescribed under section 177N.'

These requirements of section 177F(1) of the PDA 2000 (as amended) have been considered during this technical assessment.

Section 1.2 of the rEIAR states that the rEIAR has been prepared having regard to the Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, August 2017). These Guidelines have been drafted with a view to facilitating compliance with EIA Directive (2014/52/EU).

5 Remedial Environmental Impact Assessment Report Review

5.1 Background

This technical assessment is set out following the order of the rEIAR which is structured as follows:

- Chapter 1 - provides an introduction to the remedial EIAR, describing the background to requirement for rEIAR, the scope of assessment, method of preparation and identifying those responsible
- Chapter 2 - provides a description of the Derrybrien Wind Farm Project in terms of the site location and the construction, operation and decommissioning of the Project
- Chapters 3-16 - identify and describe the environmental impact of the Project
- Chapter 16 - considers major accidents and disasters
- Chapter 17 - considers the possible interaction of impacts outlined in Chapters 3-15
- Chapter 17 - provides a summary of interaction of impacts
- Chapter 18 - provides a summary of mitigation and remedial measures

It should be noted that because of the retrospective nature of the assessment, the rEIAR differs from a typical EIAR in that it identifies significant environmental impacts which have already occurred together with ongoing impacts, as well as future likely impacts as would be required in an EIAR.

The correlation between Article 3 EIA factors, (requiring the identification, description and assessment in an appropriate manner of the direct and indirect significant effects of a project) and chapter topics is set out in the rEIAR as below (as referenced in the rEIAR).

Table 5-1 Correlation between Article 3 EIA Directive Factors and the rEIAR Chapters

Article 3 EIA Directive Factor	Chapter Title
Population and Human Health	Population and Human health (Ch. 4), Noise (Ch. 5); Shadow Flicker (Ch. 6), Roads and Traffic (Ch 14)
Biodiversity	Biodiversity – Terrestrial Ecology (Ch. 7); Aquatic Ecology and Water Quality (Ch. 8)
Landscape	Landscape and Visual (Ch. 9)
Soil	Soils, Geology and Land (Ch. 10)
Land	Soils, Geology and Land (Ch. 10); Material Assets (Ch. 13);
Water	Aquatic Ecology and Water Quality (Ch. 8); Hydrology & Hydrogeology (Ch. 11)
Air and Climate	Air and Climate (Ch. 12); Noise (Ch. 5); Shadow Flicker (Ch. 6)
Materials Assets	Materials Assets (Ch. 13); Soils, Geology and Land (Ch. 10)
Cultural Heritage	Cultural Heritage (Ch. 15)
Interaction between the Factors	Interaction of Impacts (Ch. 17)
Major Accidents and Disasters	Major Accidents and Disasters (Ch. 16)

5.2 Introduction

Chapter 1: Introduction of the rEIAR gives a comprehensive account of the background to the project, an overview of the CJEU Judgements, the requirement for the rEIAR and the general methodology followed in the assessments.

Article 5(3) of the EIA Directive requires that the rEIAR is prepared by competent experts. Table 1.5 lists the qualifications and number of years' experience of the main authors and contributors to the rEIAR. It is noted that for technical specialists, 'Statements of Authority' are provided in each technical chapter which provide further information on the relevant experience of assessors. The adequacy of this information and consideration of the competency of the technical specialists is included in the following sections. The information provided demonstrates that the rEIAR has been coordinated by competent experts, as required by the EIA Directive.

No details are provided within this Chapter to document the extent to which the scope of the rEIAR has been discussed and agreed with the competent authority. It appears that no EIA Scoping exercise has been undertaken or Scoping Report prepared. The European Commission (EC) Guidance on Scoping (Ref 9) notes that scoping is not mandatory under the EIA Directive, however the guidance states that it is good practice to undertake scoping even if it is not required by legislation (Section 1.4).

Section 1.3 sets out the overarching methodology that has been applied in the rEIAR. This appears comprehensive and clearly sets out the assessment scenarios that have been assessed and the method for determining significance. In particular the significance criteria proposed adequately covers the characteristics of the potential impact set out in Annex III (3) of the EIA Directive (e.g., extent of the impact, magnitude of impact, probability, duration, frequency and reversibility). However it is noted that technical topic chapters haven't necessarily followed the overarching assessment methodology set out in Section 1.3 of the rEIAR or relevant guidance with respect to significance criteria, and the adequacy of the methodology followed (including the method for determining significance) is considered in further detail in Sections 5.5 – 5.18 of this report.

Section 1.9 details the consultations undertaken to inform the rEIAR. It appears that the requirements of Article 6(2) of the EIA Directive have been met in terms of informing the public about the Substitute Consent Application and the EIA Process, however this matter has been considered further in Section 4.4 of this report.

5.3 Project Description

Chapter 2: Project Description of the rEIAR gives a comprehensive description of the project, including (as required by the EIA Directive):

- A description of the location of the project;
- A description of the project comprising information on the site, design, size and other relevant features of the project; and
- A description of the physical characteristics of the whole project, including the construction works undertaken, land use requirements during the construction and operation phases, and a description of the likely decommissioning works.

The written description is supported with a series of Figures which help the reader to visualise the site location and the project. When reviewed against the EC ES Review Criteria no significant omissions were noted with regards to the information provided in the Project Description.

5.4 Alternatives

Chapter 3: Alternatives describes the alternatives to the project that have been considered taking into account the key objectives of the project and how these would be met by alternative options. The EIA Directive requires that an EIA Report provides '*a description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects*'.

Given the operational status of the development, the Chapter has considered the following types of alternative:

- Do-nothing;
- Continued operation and later decommissioning;
- Alternative Renewable Energy Projects on site;
- Decommissioning and remediation alternatives for the wind farm site.

The assessment of the first three bullet points includes a comprehensive comparison of the environmental effects in line with the requirements of the EIA Directive. However it is questionable how likely the developer is to develop alternative energy projects on the site and therefore how far these constitute 'reasonable alternatives'. The aim of the alternatives assessment is to help embed environmental considerations into the evolution of the project, it is questioned the extent to which this part of the assessment adds to the quality of the rEIAR, and in particular in aiding the decision making process for the substitute application.

Of more relevance and use to the decision-making process is the consideration of alternative decommissioning and remediation options as these comprise scenarios more likely to take place in the future. In comparison to the alternatives in the first three bullet points the decommissioning and remediation options are given very brief consideration, and the reasons for selecting the chosen option are not dealt with in much detail.

During construction the access track between T15 and T17 was abandoned as being incapable of stabilising satisfactorily and with no access to proposed Turbine 16 the turbine was not built. The removal of one or more parts of the development in areas where the risk of potential peat slide has been identified would be a reasonable alternative which should be considered. Neither changes to the current operational site nor alternatives during decommissioning have been considered. In conclusion, whilst it is considered that the consideration of Alternatives largely meets the requirements of the EIA Directive, its usefulness to decision makers is questionable and full consideration of reasonable alternatives (e.g. changes to the operational site and alternatives during decommissioning) have not be covered sufficiently.

5.5 Population and Human Health

5.5.1 Compliance with Legislation and Best Practice

Chapter 4 Population and Human Health contains reference to the draft Guidelines on the Information to be Contained in EIARs published by the Environmental Protection Agency (Ref 10), stating that this has been used to describe relevant effects and impacts where they occur in relation to the topic. Topics described in the guidance as applicable to Population and Human Health comprise employment, human health and amenity. This is not explicitly stated within the Chapter; although the first two of these topics are assessed, there is some ambiguity around how amenity has been considered. For example, the chapter cross-references with Chapter 13 Material Assets in relation to 'local amenity and tourism attractions' and only makes reference to amenity in relation to shadow flicker (when amenity is made up of several components of which the visual effects (shadow flicker) would be one, but equally noise and air quality impacts would also be relevant considerations).

The chapter makes reference to the 2014 EIA Directive, which introduced the requirement to consider human health within EIA. The chapter also correctly states that there is no specific guidance in relation to human health in the context of the EIA Directive and refers instead to the Commission's Strategic Environmental Assessment (SEA) Directive (Ref 11) in relation to human health (directly quoted from within the 2017 draft Guidelines). The draft Guidelines note that the assessment of impacts on population and human health should refer to the assessments of those factors under which human health effects might occur, under the environmental factors of air, water, soil and so on. This approach has been taken in the rEIAR.

The draft Guidelines require the consideration of 'interactions', thereby ensuring that effects are cross-referenced between topics. The rEIAR makes appropriate cross-reference to Chapters 5, 6, 8, 11, 12 and 14, which deal with Noise, Shadow Flicker, Aquatic Ecology, Hydrology and Hydrogeology, Air

and Climate and Traffic and Transport. More useful cross-reference could be made to Chapter 13 Material Assets with which there is related content.

5.5.2 Baseline Information

The baseline has been identified using desk-top data sources as appropriate to the topic. No study *area has been defined for the collection of baseline data. Electoral Divisions (EDs) have been used* to present population and employment data and these are illustrated in Figure 4.1. It would appear that baseline data has been collated for those EDs within which elements of the project reside (including the windfarm itself and the overhead line), although this is not directly articulated within the chapter. Equally there is no explanation as to the significance of the buffer zones identified on Figure 4.1 and the role these may play in identifying impacts. Equally, the Community Benefits text within Chapter 4 references a 10km radius from the project, but this is not referred to in the baseline and no data is provided.

Appropriate information sources have been used to identify baseline data (e.g. Central Statistics Office (CSO) Census data and associated reports). Population data provided has been taken from the 1996 Census, as most recent available data to the formal commencement of the baseline period in 1998.

The rEIAR refers to the low population numbers in the vicinity of the Derrybrien wind farm site as demonstrated by the data shown for individual EDs. There is no age profile provided; whilst the draft Guidelines do note that detailed socio-economic analysis is not generally required as part of an EIAR, age profiles of an area do help to provide context and to identify if there are particular vulnerabilities within a population (for example if there is a higher proportion of older or younger people within an area for whom environmental effects may differ).

There is no real description in the baseline as to who the 'windfarm communities' really are, with the exception of Derrybrien itself. This makes it difficult to fully understand the adequacy of the Community Benefits described later in the chapter.

An overview of tourism and employment has been provided in Appendix 4.1. The tourism data is at a very high spatial level, which may be attributed to a lack of detailed local information. However there are broad assumptions made – for example, in the jump from data relating to national visitor numbers to the statement that 'a significant portion of visitors would have been expected to have visited the West Region and this may have benefitted the general area of Gort to some extent'. The chapter refers to 'designated' recreational and amenity activities but does not present a picture of informal recreation activities (such as hillwalking) that may take place within the vicinity of the windfarm site or associated elements of the project such as the overhead line.

There is no understanding presented at baseline stage around farming from a business / viability perspective. Section 4.3.1.3 of the rEIAR (employment and socio-economics) identifies a negative effect relating to access to farmland and farming activities, however it is not clear what baseline this has been assessed against. Turbary within and immediately adjacent to the windfarm has been highlighted only from a cumulative perspective, highlighting positive cumulative economic benefits at the various stages of assessment; this does not appear to be in accordance with current activities onsite as noted earlier.

The human health baseline is presented in detail in Appendix 4.2 and covers appropriate topics such as mortality and self-reported health. However, the chapter references that different causes of mortality occur with age profile and that self-reported health also changes with gender, although there is no analysis as to what this might mean for local populations around the windfarm due to a lack of granularity in the baseline information.

It is not clear whether any consultation has been undertaken with stakeholders in relation to baseline data collection.

5.5.3 Appropriateness of Assessment Methodology and Significance Criteria

The methodology section within Chapter 4 makes general reference to the Draft Guidelines on the Information to be Contained in EIARs, stating that this has been used *'to describe effects and impacts where they occur'*. There is no reference within the chapter as to how significant effects have been

determined. It is assumed that use has been made of the table of significance provided in Chapter 1 (Table 1.2). Effects and their significance appear to have been described sporadically throughout the chapter without consistent use of the impact characteristics and the degree / nature of the effect. For example within Section 4.3.1.5 (Operational Impacts 2006-mid 2020), the chapter refers to locally significant effects (with no analysis / description as to what this might mean), and uses 'moderate', 'medium' and 'medium-term' to describe duration.

In relation to construction impacts, the level of detail provided is not considered to be sufficient or impacts appropriately justified. For example, no impacts are identified on population by use of the single metric 'population number' (i.e. no impacts are identified because there are no changes in population number as a result of the development). This element could have been set out more clearly within the scope for the chapter. Socio-economic effects associated with construction activities are high level in nature; it would normally be expected to quantify indirect effects using appropriate multipliers / methodologies, otherwise the scale of effect is hard to appreciate. In relation to tourism the rEIAR states that 'no impact would have occurred' but this does not appear to fit with the narrative provided in the baseline section which suggests there may have been a reasonable level of tourism activity.

In relation to operational impacts, the Community Benefits section identifies the effect of the Community Benefit Fund to date to be positive, locally significant and of medium term. As noted earlier, there is no baseline against which this judgement can be made.

The assessment tables for human health covers a range of assessment periods (construction, impacts which occurred during the peat slide, operational phase 2006 to end 2020, operational impacts currently occurring, operational impacts likely to occur and decommissioning impacts). The assessments are high level in nature and do not provide sufficient detail to justify conclusions within this chapter, although it is noted that reference is made to other chapters within the rEIAR where further information is provided. Examples include:

- Table 4-13 (construction effects on human health) – no reference to best practice / mitigation for construction activities relating to noise or dust emissions or consideration of potential effects on the construction workforce.
- Table 4-14 (operational impacts 2006 to 2020) – no assessment of the population who may benefit from the air quality impacts described as a result of a reduction in transboundary gas emissions (local area or wider area for example); no assessment of noise effects as they may relate to different groups within the population; no assessment or detail relating to the visual impacts described (which are categorised as moderate) in relation to a specific population.
- In relation to impacts which are occurring (set out in section 4.5.2 rather than in a table), this does not effectively set out the impacts on human health.
- Table 4-15 (operational impacts likely to occur) – no justification for how the moderately significant positive impact on health in relation to air quality has been reached.

5.5.4 Response to Stakeholder Concerns

No reference to stakeholder concerns or inputs from stakeholder concerns have been raised in the chapter.

The chapter refers to impacts on turbary cutting in the vicinity of the windfarm site, including cumulative impacts associated with such activities. The chapter concludes there to be 'an economic benefit to the turbary rights holders in the area' and refers to 'slight but positive economic effects' which are currently occurring. This appears to be in contradiction to recent warning signs posted at the site by Gort Windfarms Ltd stating "Warning! Risk of Peat Instability from Peat Harvesting on site". Further, a peat cutting contractor received documentation stating that that he would be held liable and responsible in the event of any peat slippage, resulting in the contractor refusing to undertake peat cutting with an associated social and economic disbenefit (e.g. the loss of peat used by members of the local community to heat their homes).

5.5.5 Effect of Decommissioning

The effects of decommissioning have been described in relation to population, employment / socio-economics, community benefit and human health. The assessment made within this section is considered to be reasonable, although the level of detail provided to support the assessment is high level.

5.5.6 Effectiveness of Proposed Mitigation Measures

For both population and human health, reference is made to other chapters of the rEIAR which may present mitigation of relevance (for example in relation to noise or air quality) and this is an acceptable approach.

The chapter does not identify any significant negative impacts relating to the population element of the chapter and therefore no remedial mitigation measures are presented. In relation to human health, the remedial mitigation section identifies that although significant negative impacts to the health of the population in the area have not occurred, there remains potential for their occurrence primarily from site instability in the absence of mitigation. Mitigation referred to here relates to measures associated with turbary cutting to ensure that peat instability on site does not arise. The Geology and Soils assessment notes that where updated risk assessment (based on survey and monitoring set out in 5.12.8 above) indicates moderate to high risk of slope failure, particularly in northern and western sectors of the site, those sections of the development should be abandoned, as was done for the area around Turbine 16, with specific remedial measures applied to those areas in order to reduce future loss of stability (i.e. removal of turbines and development of restoration approaches designed to enhance and ensure long-term stability of these areas). These conclusions do not appear to be presented in the assessment tables, which simply state there would be no impact.

5.5.7 Recommendations for Further Mitigation Measures

In line with other relevant chapters within this Technical Assessment of Derrybrien Windfarm and Ancillary Works (for example Noise and Vibration), the potential for additional mitigation has been raised in relation to Receptor 39 (R39) (the closest residential receptor to the site, although currently uninhabited) should it be reinstated as a residence. Human health effects here may result from noise, shadow flicker and changes to amenity. Further information relating to stabilising the site is also of relevance (as noted in sections 5.12.7 and 5.18.7 of this report in relation to Soils, Land and Geology and Major Accidents and Hazards respectively).

5.5.8 Additional Information or Evidence Required

No in-combination effects have been considered as part of the assessment, and this is an area which could be particularly important in relation to amenity effects (comprising effects from noise, air quality, visual impact and traffic and transport).

Impacts of the project on recreational activities and amenity in the vicinity of the project are not considered to be adequately dealt with.

The Major Accidents and Hazards section within this report notes that further evidence is required to demonstrate that following decommissioning, the risk of a peat slide will not increase and states that the conclusion of the rEIAR that a future peat slide is 'unlikely' is not reasonable; there are associated human health impacts associated with a potential future peat slide (refer to Section 5.18 of this report for further information).

5.5.9 Reasonableness of Conclusions and Need for Possible Remedial Works

Conclusions made in relation to population impacts associated with the wind farm highlight the various positive social impacts resulting from employment and community benefits attributed to the project. The chapter also states that the project 'contributes significantly to the displacement of imported fossil fuel cost of economic benefit to the Irish economy and will continue to do so throughout the lifetime of the project' although no real detail / justification is presented in relation to this. No significant adverse impacts on population have been identified and these conclusions are considered reasonable.

The human health section concludes that 'the distance between wind turbines and occupied buildings is always greater than that necessary to meet safety requirements. The turbines in use for Derrybrien Wind Farm have a proven record in terms of safety and reliability. In summary, the operation of the wind farm to date has not and future operation will not result in significant adverse impacts on human health'. This conclusion does not adequately reflect the assessment that has been made of human health effects throughout the chapter nor the potential issue around slope instability and potential for peat slide events highlighted earlier. Equally, it does not reflect wider impacts on human health associated with loss of / restrictions to turbary rights for local residents, which has recently happened at the site.

5.6 Noise and Vibration

5.6.1 Compliance with Legislation and Best Practice

Generally, Chapter 5 is considered as being a suitable assessment of construction, operational and decommissioning noise and vibration, based upon appropriate methodologies and assessment methods. However, we would note that the review extended to Chapter 5 and appropriate figures only, with the assumption made of professional competency and a basis of appropriate assumptions. No validation or review of acoustic modelling or calculations has been undertaken within the scope of this review.

Chapter 5 of the rEIAR discusses the impact of the development with respect to Noise and Vibration. It sets out the guidelines and methodologies which have been followed in the preparation of the assessment, covering aspects including construction, operation and decommissioning.

Section 5.2 outlines the main guidance and legislation used to consider impacts relating to noise which are appropriate for wind power development in Ireland. Generally referencing BS 5228: Pt1 2009 (+A1 2014) (Ref 12), ETSU R97 (Ref 13) and the Institute of Acoustics Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise as the main vehicles for assessment (Ref 14). Further detail of the pertinent guidance is provided in Section 5.4.

The study has been quantified within the document as implementing the appropriate prediction protocols for noise associated with construction/decommissioning and operational aspects of the study, including the proprietary software used for the purposes of the prediction of noise (Predictor Software).

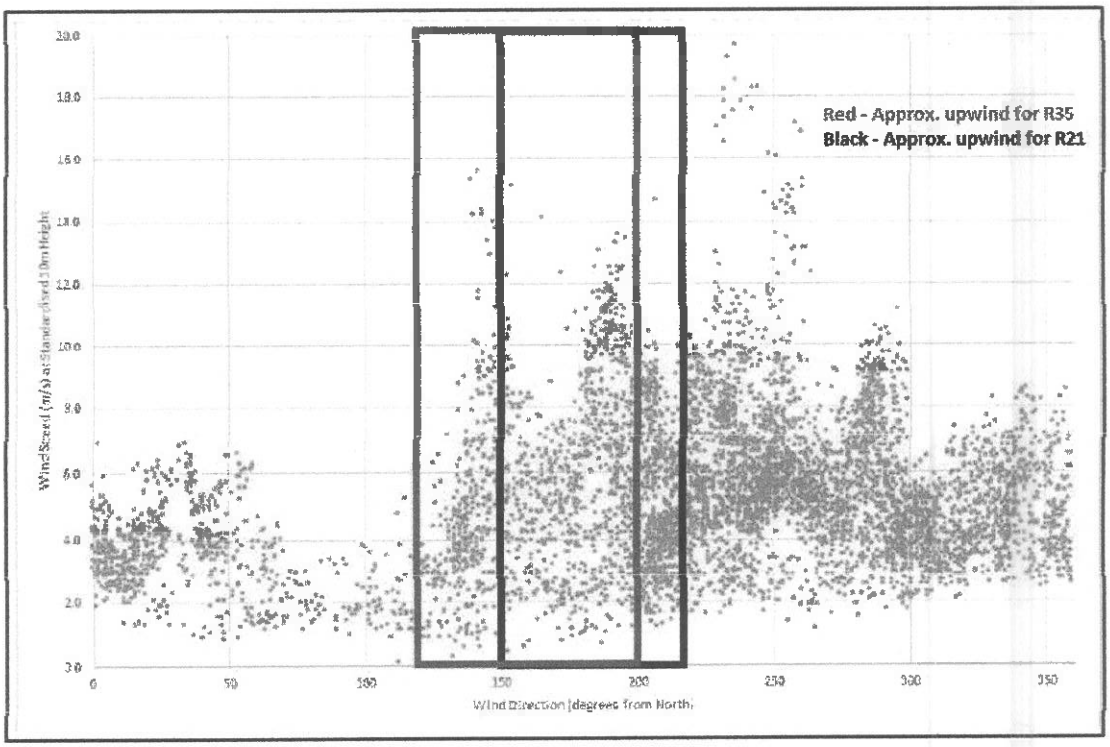
5.6.2 Baseline Information

The baseline information presented within Section 5.5, and approach taken to compiling this seems appropriate.

Within the report it is stated that surveys were undertaken between September and November 2018 at 2 locations, defined in an appropriate manner (relative to the predicted 35dB(A) operational noise contour).

No surveys were undertaken at R39 which is significantly closer to the development than any of the other receptors but as this is an unoccupied property, we accept that equipment security is a key concern that would preclude long term unattended surveys.

The data was then screened for wind direction (to account for upwind conditions to remove existing turbine noise contribution), rainfall and amenity hours such that a vast proportion of the dataset was removed from the baseline analysis. The figure below shows the data included based upon wind direction alone at each receptor, demonstrating the amount of data required to be discounted from the baseline analysis in the first instance.



This data was then further screened for rainfall and amenity hours meaning that the data set for use in the setting of the wind derived baseline was reduced still further.

Reference to Figures 5.8 to 5.11 demonstrate a vastly reduced dataset used to derive the baseline noise climates when wind direction and rainfall is accounted for along with amenity hours. Whilst each windspeed "bin (measured 1m/s wind speed bands)" on said figures does have a number of datapoints in, these are generally widely scattered around the best fit line. Can it be confirmed how many amenity hours datapoints were taken forward into the baseline analysis following the upwind and rainfall screening.

However, it is noted that it is likely that the baseline analysis is as robust as can be reasonably expected taking account of the fact that the site is fully operational and there is no feasible opportunity to shut the site down to undertake an alternative baseline survey without turbine noise.

Further justification for setting 37.5dB as the lower limit from the 35dB to 40dB range presented in guidance is required. Currently insufficient information is deemed to be presented to justify this stance, with the main context for the conclusion being drawn from a document relating to licenced waste management facilities, and not relevant to wind farms in rural settings.

5.6.3 Appropriateness of Assessment Methodology and Significance Criteria

The assessment methodology presented within Section 5.4 seems generally appropriate.

The study of noise references appropriate methodologies including BS 5228: Pt1 2009 (+A1 2014), ETSU R97 and the Institute of Acoustics Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise.

Construction vibration is limited to the consideration of damage criteria from both BS 7385: Pt2: 1993 and BS 5228: Pt2 2009 (+A1 2014). There is no mention of human perception criteria which is typically *much lower than that of damage criteria.*

Reference is made in the Chapter to the 2006 edition of the Wind Energy Development Guidelines (Ref 16). It is noted that a draft has been issued of a 2019 version of the guidance (Ref 17), but the Chapter presents and discusses this, outlining the concerns that have been raised within the acoustic

community to aspects of the document. There is a potential that the requirements of the 2019 version would require changes to the Chapter, however, as a result of the nature of the 2019 version (draft) and the concerns raised by the Institute of Acoustics (IOA) this has not been implemented. There is however discussion of aspects of the 2019 version presented within the document.

Section 5.6 considers significance criteria for construction activities based upon Environmental Protection Agency criteria for the description of effects, but this is not detailed within the Chapter as to the nature of the semantic scale used.

5.6.4 Response to Stakeholder Concerns

There are no stakeholder concerns referenced or detailed within the scope of the noise and vibration Chapter (Chapter 5).

5.6.5 Effect of Decommissioning

The assessment and consideration of decommissioning is sufficiently covered based around the premise that activities would be similar to that of construction, which is fully assessed and considered in Section 5.6 (5.6.1.1 to 5.6.1.3).

Concerns are raised about impacts and effects on R39 as detailed below.

However, it is noted that the consideration of the appropriateness of the study of both construction and decommissioning is based upon the information presented within the Chapter; no review of the detailed calculations informing the study, or the information provided relating to programme and plant compliments associated with the construction/decommissioning have been undertaken. Chapter 5 has been reviewed as presented, with the assumption made of professional competency and a basis of appropriate assumptions.

5.6.6 Effectiveness of Proposed Mitigation Measures

Construction and Decommissioning mitigation is based around the principles of BS 5228: 2009 (+A1: 2014) and the principles of Best Available Technique (BAT). This is standard practice for construction noise, especially as daytime impacts were concluded to be acceptable.

However, it is noted that within Sections 5.6.1.1 to 5.6.1.3 it is stated that predicted construction noise levels comply with appropriately defined significance thresholds for assessment periods where it is *not the case. The document defines activities such as Construction Haulage, Grid Connections/* Overhead Line, and Substation construction works as conforming with daytime, evening (and Weekend) and overnight significance thresholds where it is not the case. Generally, all construction and decommissioning activities comply with daytime BS 5228 Pt1: 2009 (+A1: 2014) limits, but Construction Haulage, Grid Connections/ Overhead Line, and Substation construction works would not comply with evening (weekend) or overnight thresholds in certain cases. This is likely to require additional mitigation especially during Decommissioning relative to weekend working, as construction has already occurred.

There is no specification of how decommissioning activities would be monitored to ensure compliance with appropriate thresholds. This is also the case for construction, but it is noted that construction works have already occurred.

Based upon the results of the operational modelling and assessments of noise as presented in the Chapter no additional mitigation is proposed for operational turbine noise within the site or turbine specifications. As to whether the calculations and data analysis underpinning this are correct it is noted that Chapter 5 has been reviewed as presented, with the assumption made of professional competency and on the basis of appropriate assumptions; no validation of calculations has been undertaken within the scope of this review.

5.6.7 Recommendations for Further Mitigation Measures

Whilst generally it is concluded that the assessment of operational noise is acceptable, subject to the assumption that all modelling and calculations were undertaken appropriately, there are concerns

relating to certain of the conclusions drawn, specifically relating to R39 which is a disused residential dwelling.

The conclusions for all other dwellings considered (totalling 41no.) based upon the information presented within the Chapter are considered acceptable.

During construction it is noted that the author believed the property to be entirely empty for the entire construction period; on this basis and as the construction works are completely finished (and the wind farm operational) there would have been no residents there to perceive any impacts and as such we concur with the conclusions.

With regard to decommissioning, which is yet to occur, there is a potential that additional mitigation may be necessary at R39 should it be reinstated as a residence and occupied. The assessments presented in the Chapter assume that it would be empty which cannot be guaranteed unless the operator owns the property (or has a legal agreement) and can ensure this is the case. Specifically, concern relates to decommissioning haulage, decommissioning of grid connections/ overhead lines, and decommissioning of the substations where the data presents predicted levels which could breach weekend thresholds (decommissioning hours stated as 07:00 to 19:00 Monday to Friday, and 07:00 – 14:00 Saturday). This would need to be specifically considered within any Environmental Management Plans or Codes of Practice necessary for the decommissioning works and would require detailed measures to be presented for control and monitoring of decommissioning activities under the principles of Best Available Technology (BAT), and complaints procedures for that period.

Similar concerns are raised with regard to the operational phase noise assessment for R39, which again is predicated on the basis that the property is empty which can only be guaranteed if the operator owns the property and land or has appropriate legal agreements.

5.6.8 Additional Information or Evidence Required

Based upon the conclusions drawn are generally accepted, with reservations relating to the property represented by R39.

Confirmation is required regarding how many amenity hours datapoints were taken forward into the baseline analysis following the upwind and rainfall screening.

Concerns relate to the fact that this is the only property adversely impacted by the development (construction, operation and decommissioning), with no mitigation proposed on the basis that it is not occupied.

For this control to be acceptable confirmation is necessary that the property is still unoccupied, that it will be unoccupied for the duration of the operational life of the wind farm and during decommissioning. However, we would assume that there are limited opportunities to ensure this unless the property is owned by the operator or the operator has legal agreements with the property owner to ensure it remains empty. In the absence of this there is the potential for adverse effects at this property which are not fully controlled during both operation and decommissioning.

Concern is also raised with regard to the justification for setting 37.5dB as the lower limit from the 35dB to 40dB range presented in guidance. Currently insufficient information is deemed to be presented to justify this stance, with the main context for the conclusion being drawn from a document relating to licenced waste management facilities, and not relevant to wind farms in quiet rural settings (Tables 5.11 to 5.14 show L_{A90} levels between 20 and 30dB). Further justification on this is necessary as should the threshold be set at 35dB the issues at R39 would be further exacerbated during operation at certain wind speeds. Albeit that it is accepted that the reduction in this lower limit to 35dB would only be an issue at R39 and subject to the confirmation of the status of the property may not be an issue.

5.6.9 Reasonableness of Conclusions and Need for Possible Remedial Works

Generally, Chapter 5 is a robust and considered assessment of the wind farm based upon acceptable guidance and methodologies. In general, the conclusions of the Chapter seem reasonable and are accepted.

Key concerns relate to the issues raised relating the status of the property at R39 where adverse impacts are predicted to potentially occur during operation and decommissioning and are not controlled as the property is stated to be unoccupied. Assurances would be needed that this is the case for the lifespan of the wind farm and the decommissioning phase for the conclusions of the Chapter to be acceptable. Should this not be the case, and no assurances can be made that the property would remain unoccupied, then there is a potential for adverse impacts which have not suitably been controlled within the works presented and additional mitigation may be necessary. These adverse impacts also include night-time operational impacts which would be a key concern for any resident.

It is further noted that the consideration of the information presented within Chapter 5 is reviewed on the basis as presented. No independent modelling or predictions have been undertaken within the scope of this review and professional competency has been assumed. Furthermore, within the scope of the review the base information, modelling or spreadsheet calculations informing the Chapter have not been reviewed, considering the results as presented.

5.7 Shadow Flicker

5.7.1 Compliance with Legislation and Best Practice

Chapter 6 defines the scope of the report, by way of detailing a list of recent studies and guidance documents, and standard constraints faced by this type of assessment, as well as technologies/software and approaches used. This is comprehensive, if a little long-winded in places, but adequately sets the scene for the approach to the assessment.

The following methodology section 6.1.3 again discusses relevant guidance documents and studies, and sets out the software (EMD WindPRO v3.3) and process utilised to undertake the assessment calculations. This seems appropriate for the type and scale of the assessment.

There is limited information evident regarding the type and accuracy of the digital terrain model used for the calculation. The report states that it was a 'Terrain elevation model - sourced from Ordnance Survey Ireland.'

5.7.2 Baseline Information

The baseline information presented within section 6.2 (and Appendix A, as well as Tables 6-1 and 6-2), and approach taken to compiling this seems appropriate.

5.7.3 Appropriateness of Assessment Methodology and Significance Criteria

Parameters for assessment, such as the extent of the assessment, and the threshold of significance of effects, are set out in wind energy planning guidance documents by the governments of England, Ireland, Northern Ireland and Scotland. Although these are broadly similar, the details/levels are different between the guidance documents. There are no standard methodologies. However, there are only three industry recognised modelling softwares used, which tends to standardise the modelling and calculation of assessment figures.

Section 6.1.3 (Methodology) of the rEIAR assessment correctly references the most current Irish Government Wind Energy Guidelines (Ref 18)). This document details assessment parameters and control measures but is quite broad in its provisions.

Section 6.1.1 (Chapter Scope) references the Review of Light and Shadow Effects from Wind Turbines in Scotland (LUC 2017) document (Ref 19), in particular quoting that Shadow Flicker may occur beyond a 10-rotor diameter threshold. This represents a worst-case scenario for an extent of assessment. Surprisingly, this document is not listed within the guidance documents used to inform the assessment.

5.7.4 Response to Stakeholder Concerns

There are no stakeholder concerns raised within the assessment, probably due to limited receptors being within range to be affected by shadow flicker effects (significant or otherwise).

5.7.5 Effect of Decommissioning

Not relevant for this assessment / Chapter.

5.7.6 Effectiveness of Proposed Mitigation Measures

Section 6.5.2 details that only one receptor (R01) is considered to be within range to be affected by *shadow flicker effects resulting from the project. This receptor is a currently uninhabited building, but* despite this, the section states that the property would not experience significant effects sufficient for mitigation to be considered.

The section goes onto to outline that if a complaint from a future resident is received, mitigation measures which are outlined, will be utilised.

However, this is slightly different from the approach advocated to mitigation in the Irish Government Wind Energy Guidelines. This states that if a "*shadow flicker prediction model indicates that there is potential for shadow flicker to occur at any particular dwelling or other potentially affected property, then a review of site design involving the possible relocation of one or more turbines to explore the possibility of eliminating the occurrence of potential flicker is required.*"

5.7.7 Recommendations for Further Mitigation Measures

Not relevant for this assessment / Chapter.

5.7.8 Additional Information or Evidence Required

It is recommended that there is a commitment to mitigation measures (as outlined in section 6.5.2) if the property becomes occupied.

5.7.9 *Reasonableness of Conclusions and Need for Possible Remedial Works*

Given the limited nature of effects experienced within the study area, with only one receptor affected (and not to a significant level of effect), the conclusion text seems appropriate.

5.8 Biodiversity (Terrestrial Ecology)

5.8.1 Compliance with Legislation and Best Practice

Chapter 7 of the rEIAR provides a list of the legislation and other statutory policies and guidance relevant to Biodiversity in section 7.2.2 and 7.2.3.

This legislation provided is largely comprehensive, but the following should be included:

- The Flora (Protection) Order 2015 S.I. 356 (Ref 20)
- Project Ireland 2040 National Planning Framework (February 2018) (Ref 21)
- Galway County Heritage and Biodiversity Plan 2017-2022 (Ref 22)
- Relevant policies in Actions for Biodiversity 2011-2016, Ireland's 2nd National Biodiversity Plan produced by the Department of Arts, Heritage and the Gaeltacht in 2011 (now the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs) (Ref 23)

Some guidance could have been added or updated:

- Collins, J. (ed) (2016) Bat Surveys for the Professional Ecologists: Good Practice Guidelines (3rd edn.) by the Bat Conservation Trust (Ref 24) should have been cited in addition to the 2nd edition 2012 guidance.
- Similarly, CIEEM guidelines 2018, were updated as version 1.1 in September 2019 (Ref 25) and should have been cited as such.
- National guidance for planning authorities on Appropriate Assessment of plans and projects in Ireland was published by the Department of Environment, Heritage and Local Government (DEHLG) in 2009. It was updated in 2010 (Ref 26), by replacing the term "Statement for Appropriate Assessment" with "Natura Impact Statement" or "NIS and should have been cited as updated.

- Bird species of medium and high conservation concern listed in the publication Birds of Conservation Concern in Ireland (BoCCI) 2014 – 2019 (Ref 27) not referenced.
- Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2010) Valuing bats in ecological impact assessment. In Practice, No 70, Institute of Ecology and Environmental Management would have been helpful for the bat assessment (Ref 28)
- Guidelines for Consideration of Bats in Wind Farm Projects (2014, Eurobats Series 6))Ref 29) would also have been helpful.
- Guidance on Ecological Survey and Assessment in the UK During the COVID-19 Outbreak Version 4 (CIEEM 2021) (Ref 30)

Using some of this guidance would be helpful to structure the assessment.

5.8.2 Baseline Information

Desk study

The decisions in relation to the planning applications and appeals for the wind farm and grid connection were made in the period 1998 – 2001. Therefore, for the purposes of this rEIAR the baseline date is circa 1998 – 2001 as stated in section 7.2.1. Sources used were:

- A desktop review of existing datasets and the original Environmental Impact Statements (EISs) prepared for the Project during the pre-planning stages.
- Aerial photography (historic and recent) was used to assist in determining the type and distribution of habitats within the project area prior to the commencement of the construction phase. The nature and distribution of habitats allowed certain assumptions to be made in relation to fauna species likely to have been present pre-construction.
- Ecological monitoring of the project began in 2003 during construction of the project. The monitoring has at various times included bird, bat, terrestrial habitats and aquatic ecology and fisheries field surveys. The results of these surveys have informed the impact assessment of the operational phase of the development and have also defined the existing receiving environment conditions against which the potential impacts associated with the decommissioning phase can be assessed.
- Section 7.2.4 lists the desk top study data sources which are extensive, missing from this list however is the Hen Harrier Project Annual Report which should have been cited.

Habitats

Section 7.2.6 outlines the Field Survey methodology, while numerous habitat surveys are stated as having been undertaken between 2004 and 2018 following Smith et al. 2011 "Detailed botanical and habitat descriptions were prepared for areas of ecological interest within the project area" it is not clear if this constituted a detailed botanical survey.

Breeding birds

For breeding birds, while targeted hen harrier surveys were undertaken, and methodology presented (Section 7.2.6.2). *"There are issues with the methodology, no regularity of hours, some had 9 hours,* some 7, some 8. There should be a standardised number of hours. Also, wintering harrier surveys were carried out for only 3 months, these should have been Nov-Mar at least. 2 Vantage Points were almost certainly not enough to cover this whole site. Four VPs would be a suggested minimum. Target species of only hen harrier and merlin. It's well known that other raptors are susceptible to collisions (even refenced in this document), so the target species should be broader.

Full breeding and wintering surveys should have been carried out. it was not clear what survey standards the breeding bird surveys were undertaken to. Any open areas should have had Brown and Shepperd carried out for breeding waders.

The wider area around the site, to approximately 5 km from the site boundary, was checked for breeding occupancy based largely on information available from previous surveys. This wider area is known as the hinterland or peripheral area. Surveys here were mainly in the early part of the season (March-May) when territorial birds are most active. However, later visits were made to occupied

territories to assess breeding success." Methods for wintering birds have not been provided. Guidance such as SNH recommended bird survey methods to inform impact assessment of onshore wind farms May 2014 (Ref 31) would have been appropriate.

The total population for the Slieve Aughty Mountains in the first National Hen Harrier Survey in 1998-2000 was 15-23 pairs (Ref 32). Since the start of the monitoring surveys for breeding territories in 2005, up to 14 breeding territories were identified within an approximate 5 km radius of the wind farm, 14 confirmed (Table 7.7) this has declined to a possible 5, (2 confirmed 3 possible) in 2018. There was an almost 50% decline in the wider Slieve Aughty Mountains. This decline hasn't adequately been assessed in subsequent sections.

Bats

A bat activity survey was undertaken on 5 November 2011 (Section 7.2.6.3.1) this is during the hibernation season and is therefore an invalid survey and should be stated as such in the baseline (it was not).

For the 2016 surveys, driven transect surveys were undertaken, the guidance cited is the 2nd edition of BCT guidelines 2012 (Ref 33), and that "Surveys started at sunset, as recommended in BCT (2012) guidance", however, the BCT guidance states a start 15 minutes before sunset. See excerpt Table 7.1 below. It should also be noted that driven transects "can be useful to supplement walked transects and provide additional survey data when surveying for proposed road widening schemes or on large sites" (BCT guidelines section 7.6.3) they should not be used as an alternative to walked transects.

Static surveys were undertaken in 2016 from April to August, and in 2019 from August to October. The SNH guidance stated as being followed requires "the minimum level of pre-application survey required using static detectors is 10 nights in each of: spring (April-May), summer (June-mid-August) and autumn (mid-August-October)". This method wasn't followed.

Table 7.1 Recommended timing for individual activity surveys. See Table 7.2 for automated surveys and for the recommended frequency of individual activity surveys (survey effort)

Survey objective	Dusk survey	Pre-dawn survey (if undertaken)
Bat activity away from roost (e.g. transects; all species)	START: 1/4 hour before sunset[1] LENGTH: 2-3 hours[2]	LENGTH: 2 -1 1/2 hours FINISH: sunrise[3]
Mating activity & swarming sites (all species)	START: approximately sunset LENGTH: 4+ hours after sunset	–

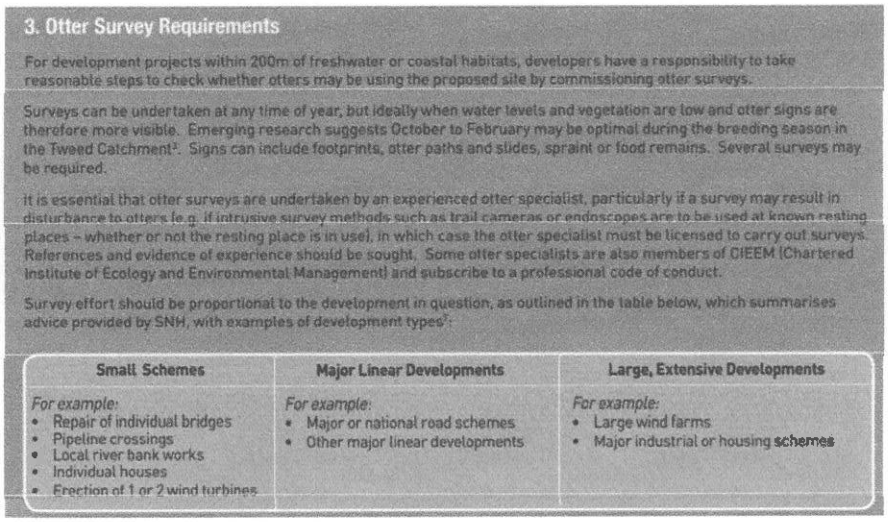
Notes
1 Some bat species emerge earlier; starting 1/2 an hour before sunset may be more appropriate (Dietz and Yalden 2009).
2 When the site is larger than 1ha, or at sites within 4 km of a greater horseshoe bat roost, 3 hours may be required.
3 Some bat species return to their roost whilst it is light and may require longer survey periods (Dietz and Yalden 2009).

No roost surveys are cited nor reported on. These should have been carried out for the trees that were removed from site.

Otter

No survey guidance for otter is cited in section 7.2.6.4 Mammals (other than bats) other than National Roads Authority (2006b) Guidelines for the Treatment of Otters prior to the Construction of National Roads Schemes. It is not clear whether appropriate baseline surveys were undertaken. The visual assessment undertaken in 2003 did not state whether surveys were undertaken of the bank from within the water course or from the bank. No methods are cited for the dedicated otter survey undertaken in July 2018, other otter results are from incidental observations. From the information presented it appears that that 1 day of otter surveying was undertaken post 2003 which would seem to be an under survey in terms of area, timing of survey and number of surveys. Guidance such as

SNH Technical Advice Note 2 for Otter Surveys (Ref 35) would be appropriate, see section 3 excerpt below.



3. Otter Survey Requirements

For development projects within 200m of freshwater or coastal habitats, developers have a responsibility to take reasonable steps to check whether otters may be using the proposed site by commissioning otter surveys.

Surveys can be undertaken at any time of year, but ideally when water levels and vegetation are low and otter signs are therefore more visible. Emerging research suggests October to February may be optimal during the breeding season in the Tweed Catchment[3]. Signs can include footprints, otter paths and slides, spraint or food remains. Several surveys may be required.

It is essential that otter surveys are undertaken by an experienced otter specialist, particularly if a survey may result in disturbance to otters (e.g. if intrusive survey methods such as trail cameras or endoscopes are to be used at known resting places – whether or not the resting place is in use), in which case the otter specialist must be licensed to carry out surveys. References and evidence of experience should be sought. Some otter specialists are also members of CIEEM (Chartered Institute of Ecology and Environmental Management) and subscribe to a professional code of conduct.

Survey effort should be proportional to the development in question, as outlined in the table below, which summarises advice provided by SNH, with examples of development types[3]:

Small Schemes	Major Linear Developments	Large, Extensive Developments
For example: • Repair of individual bridges • Pipeline crossings • Local river bank works • Individual houses • Erection of 1 or 2 wind turbines	*For example:* • Major or national road schemes • Other major linear developments	*For example:* • Large wind farms • Major industrial or housing schemes

Other Mammals

No other mammal surveys were undertaken as the rEIAR states that "Based on an assessment of current habitat suitability for other large mammals within the wind farm site and along the OHL corridor, no other dedicated large mammal surveys were undertaken" yet the National Roads Authority (2006a) Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (Ref 36) was cited in the guidance section. It would have been helpful to cite the distribution records for badger in Ireland or describe the unsuitability of the habitats for scoping out this receptor.

All other fauna were scoped out of the terrestrial section without sufficient evidence.

This is a complex data set which may not accurately reflect the pre-construction baseline therefore precautionary assessment and a clear statement of limitations should be stated. These were not stated within the baseline section.

Baseline Summary

The baseline is under described for amphibians and common lizard, badger, breeding and wintering birds other than Hen Harrier, roosting bats, otter, red squirrel and pine marten. Some of the surveys discussed are below best practice. It is also slightly confusing as to timing of the baseline as it is sometimes inconsistently described.

A table would be helpful with surveys, guidance followed, deviations from guidance clearly stated, and dates of surveys listed. An alternative means of assessment should be presented when survey data are not available. Clear scoping in and out with justification for each receptor should be presented, ideally in a tabular form. Clear limitations and precautionary assessment methods statements should also be listed per receptor. Given that this is a recreation of a baseline in the past, the CIEEM Guidance on Ecological Survey and Assessment in the UK During the COVID-19 Outbreak presents useful alternative methods of survey and data gathering and would be useful in this case.

5.8.3 Appropriateness of Assessment Methodology and Significance Criteria

Onsite

Although the updated September 2019 CIEEM guidance is not referenced, this is not likely to be a material issue. Again, the CIEEM Guidance on Ecological Survey and Assessment in the UK During the COVID-19 Outbreak presents useful alternative methods of assessment and would be useful in this case.

There is no clear scoping assessment and due to the formatting and layout of the document it can be very difficult to follow the assessment.

Zone of Influence

Zone of Influence (ZOI) (section 7.2.5) was stated for:

- Natura sites, 15km;
- Bats, 10km;
- Birds, 10km; and
- Terrestrial habitats site boundary and immediately adjacent

No ZOI was stated for otter, although a single survey was undertaken within the site. No ZOI was stated for red squirrel, pine marten or badger.

Limitations

"Difficulties encountered" are reported in section 7.2.8. This section opens with "in general, no significant difficulties were encountered in carrying out the assessment of the impact of the Project on biodiversity". The section does proceed to discuss the issues with incidental, historical and third-party data sets. However, it proceeds to state that "it is considered that the data available is adequate to describe and assess the baseline terrestrial environment present within the Project area prior to development".

It would be expected that clear limitations would be presented per receptor with deviations from best practice guidance accompanied by detailed additional survey and its correspondence with best practice guidance and/or precautionary assessment procedures where this baseline data could not meet the required quality.

General Structure

The whole document would benefit enormously from tabulated sections detailing the Important Ecological Features, survey limitations and precautionary assessment.

Habitat evaluations within the site:

- Conifer plantation: is valued at local importance, lower value; however, the plantation *appears to have been planted on inappropriate habitats such as bog and heath and* therefore it may be appropriate to evaluate the underlying habitat separately. The future baseline and restoration potential for the habitat should also be considered.
- Cutover bog: degrades and evaluated as being of local importance, higher value; however, as a habitat of potentially high distinctiveness and global rarity the potential future baseline and restoration potential for the habitat could also be considered.
- Upland blanket bog: "The habitat corresponds with the Annex I habitat Active Blanket Bog and is deemed to be of high local importance." Given the global significance of this habitat it would be helpful to have this considered within the wider national and international context.
- Dystrophic lake: "the lake appeared to be in a relatively natural state. Natural dystrophic lakes and ponds are listed on Annex I of the EU Habitats Directive [habitat code 3160] and therefore the habitat is deemed to be of high local importance." This seems reasonable.

Habitats outside the windfarm site affected by the peat:

- Conifer plantation: Local importance low value
- Wet heath: Local importance higher value
- *Wet grassland: Local importance low value*

In general, these habitats seem to be valued at a local level as there is "plenty of this habitat around" however the global context and future restoration potential of the blanket bog and cutover bog has not been considered.

Bats

For bats, while in the assessment text it is acknowledged that for the bat survey results in 2011 "It was noted that the survey was carried out towards the end of the bat active season and that the results were likely to be an under-representation of bat activity at the site." the surveys were undertaken in November so would be completely invalid.

There is no acknowledgement of the potential under recording of brown long eared bats in the 2016 data, these often do not echolocate or echolocate at a volume that can be recorded and so are often underrepresented in survey data.

There were large differences in bat survey results between 2016 and 2019 as the surveys were not replicated temporally/seasonally it is not possible to know what caused these differences. For the most part the value of the site is assessed as being at site or local level, the justification for which is the wide availability of similar habitat in the surrounding area.

- Common and soprano pipistrelle: site value
- Nathusius' pipistrelle "Seven confirmed Nathusius' pipistrelle passes were recorded during the surveys. One pass was recorded at T33 in the middle of the night on 07 September 2019 and six passes 0.0 2.0 4.0 6.0 8.0 10.0 12.0 Bat passes per hour (P/h). The six passes all occurred within a two minute period." It is also acknowledged that Nathusius' is one of the rarest in Ireland however the site is considered to be of negligible value to this Important Ecological Feature (IEF).
- Leisler: site value
- Brown long-eared: site value (masonry bridges site value)
- Natterer's: local value (masonry bridges site value)
- Daubenton's: negligible value (masonry bridges site value)
- Whiskered: negligible value (masonry bridges site value)
- Lesser horseshoe: negligible, however this species was not recorded and habitat is suboptimal so could be scoped out.

Bats may have been undervalued. Greater detail as to the justification of the value of the individuals and assemblage would be welcome. A structured assessment methodology would be welcome such as Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2010) Valuing bats in ecological impact assessment. *In Practice, No 70, Institute of Ecology and Environmental Management would have* been helpful for the bat assessment.

Birds

Birds are not valued within the assessment section to a geographic level as per the CIEEM guidelines that are cited.

Birds seem to have been assessed to a different mythology rather than CIEEM (i.e. not geographically valued or assessed). There should be clarification on whether the Percival method been used. Percival (2003) (Ref 37) details an assessment methodology to determine the significance of an impact based on the product of the sensitivity of the receptor and the magnitude of the effect. The sensitivity of a species is defined by Percival (2003) as its ecological importance and nature conservation interest at the site being assessed. Species which are of special conservation interest of a European site have the highest sensitivity rating. The significance of any one impact is a product of the sensitivity of the receptor, the magnitude of the impact and the probability of that impact occurring.

While the focus on hen harrier is welcome this seems to be to the reduction or exclusion of other species. Birds should be sectioned out as breeding assemblage, wintering assemblage and then particular species, such as hen harrier. Also, merlin is mentioned a few times, but not everywhere. If they are assessing merlin as a target species it should be assessed all the way through or scoped out. There is no standardisation.

Other Mammals

It is acknowledged that "preconstruction the 344.5 ha wind farm site had 265 ha of conifer plantation of which 222 ha was felled to facilitate construction of the wind farm" and that it would "have had the potential to support a number of mammal species". Incidentally, it should be noted that the areas cited are inconsistent through the rEIAR. Chapter 13 Material Assets for example reports that "the total area of the forestry felled was circa 150 ha, inclusive of roads, firebreaks, forest plantations and some open areas."

There were records of and incidental sightings of (pine martens) red squirrel, pine marten and badger however, no surveys were undertaken for nor have they been valued, they have been scoped out of the assessment. It is acknowledged in section 7.3.7.2 that "The surrounding coniferous plantations offer habitat suitable for breeding and foraging for all three mammal species, however, the habitats within the Project boundary only offer opportunities for foraging for badger and pine marten. Red squirrel is unlikely to occur regularly in the open habitats within the Project boundary." However, this should be a pre-construction baseline therefore these receptors should have been scoped in, evaluated and assessed on a precautionary basis.

Amphibians and Reptiles

Amphibians and lizard are mentioned in the assessment under other fauna section 7.3.8, no surveys are cited, there is an acknowledgement of a likely negative effect on amphibians, and a likely positive effect on common lizard. These species should be appropriately scoped in, evaluated and assessed.

5.8.4 Construction Assessment

Habitats:

The rNIS concluded:

- No significant effects on any European sites. The conservation objectives of Slieve Aughty are to "maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA" which are Hen Harrier and Merlin. However, the site is clearly failing its conservation objectives and neither the rNIS nor the rEIAR adequately assess the potential for operational disturbance alone or in combination. See the subsequent section on birds for detail. Mitigation should be proposed to restore the SPA to favourable conservation status
- *Other designated sites no effect*
- Conifer plantation minor permanent not significant which would seem sensible given the underlying habitat
- Habitat alteration from commercial forestry to open habitat is considered to be a positive long-term impact of moderate magnitude which is agreed
- Area around the artificial lake, the habitat alteration in this area is deemed a neutral permanent impact that, based on the low value of the original habitats, has led to no significant effect.
- *Cut over bog: However, these localised drainage effects are considered to have had a* minor negative long-term impact (no significant effect) on the cutover bog, given the subsequent peat slide and mid-term drainage effects this would seem to be under assessed. Also no consideration given to the potential future baseline should restoration be undertaken
- Habitat loss under hardstanding does not seem to have been assessed although Table 7.18 does present the habitat loss totalling 15.54ha.

Table 7.18: Summary of direct habitat loss in footprint of development.

Construction activity	Habitat(s) affected	Area Affected (ha) (Approximate)
Site access tracks	Felled conifer plantation (WS5) Cutover bog (PB4)	8.3
Turbine base and hardstanding areas	Felled conifer plantation (WS5) Cutover bog (PB4)	4.9
Derrybrien Substation	Felled conifer plantation (WS5)	0.4
Construction Compound	Access track (BL3) Conifer plantation (WD4)	0.29
Met masts	Felled conifer plantation (WS5) Cutover bog (PB4)	0.05
Agannygal Substation	Felled conifer plantation (WS5)	1.6

Birds

- Habitat loss regarding the removal of the conifer plantation is considered a positive impact of long-term duration resulting in a significant positive effect. However, the impact on some species in the short term for the negative (tree breeding species for example) isn't assessed.
- It's confusing as to what is the actual assessment. Loss of habitats is a good example (7-102 down). There are 5 separate assessments within this section. Tabulation would greatly help this section.
- Habitat loss of pre thicket rotation coniferous forest - while the loss of up to 11 ha of future pre-thicket second rotation forest is considered a negative impact, the effect on hen harrier is rated of slight significance and of medium-term duration (i.e. potentially available to harriers for up to 10 years before canopy closes).
- Habitat loss of cutover bog - overall, the loss of approximately 0.7 ha of cutover bog as a habitat for birds is considered a long-term negative impact however not resulting in a significant effect.
- Overall, the removal of the conifer plantation from along the OHL corridor and without replanting is considered a positive long-term impact as the conifer habitat is alien to the landscape and of low value for birds. This is considered to have been a significant positive effect for local bird populations. This loss has not been systematically assessed. The effect on nesting birds has not been assessed.
- Loss of nests considered not significant with the exception of snipe nests as a moderate negative impact considered to be a significant effect as the national population is in long term decline. Snipe are not however further mentioned in terms of residual effect or mitigation.
- Disturbance to hen harrier and snipe are specifically mentioned, such an effect is considered as significant but of temporary duration no mitigation is presented.
- The total population for the Slieve Aughty Mountains in the first National Hen Harrier Survey in 1998-2000 was 15-23 pairs (Ref 32). Since the start of the monitoring surveys for breeding territories in 2005, up to 14 breeding territories were identified within an approximate 5 km radius of the wind farm (Table 7.7). This declined to a possible 5 (2 confirmed, 3 possible) in 2018. There was an almost 50% decline in the wider Slieve Aughty Mountains. There are results from the 2020 monitoring[1] that show 6 pairs. This is a progressive decline from the 24-27 pairs in 2005, 15-23 pairs in 2010 and 8-14 pairs in 2015. This is a 75% decline if the lower range of 24 is used for 2005. Details for Merlin are not provided.

[1] http://www.henharrierproject.ie/HHP_HH_Monitoring_2020.pdf

- Reasons for potential decline have included windfarm developments including services lines and disturbance as well as undergrazing, maturation of conifer forest, egg predation and persecution. As no impact was assessed for the construction of the windfarm it would be inferred that this decline is due to operational effects? However, this is not progressed in that section to be discussed therefore there is no mitigation for this effect.
- *The rNIS is quite confusing in its layout. It is 288 pages long (137 pages up to references)* with a lot of wordy repetition so tabulation would help clarify the assessment. Access and recreation are noted as an impact pathway that causes harm. The SPA is failing its conservation objectives. Construction disturbance is acknowledged as likely to have occurred as a temporary impact and habitat loss is noted but again deemed insignificant. Disturbance caused by maintenance is deemed insignificant and disturbance caused by ease of access is not assessed as part of the operational phase. An adverse effect on breeding within 1km of the turbines is also deemed not significant. However, the decline of the population is worsening, and this assessment does not have the evidence to prove that *this project alone or in combination is not affecting the integrity of the site. Additional* mitigation should be provided with continued monitoring.

Bats

- There is no assessment of roosting resource loss within felled conifer plantations
- Lesser horseshoe bat, whiskered bat, and Daubenton's bat potential impacts are considered to be negligible not significant
- Brown long- eared temporary negative at site level, long term positive site level, overall not *significant*
- Natterers temporary negative at site level, long term positive site level, overall not significant
- Nathusius negligible not significant
- Common and soprano pipistrelle temporary negative at site level, long term positive site level, overall not significant
- Leisler's temporary negative at site level, long term positive site level, overall not significant
- These assessments cannot be justified given the lack of baseline information and valuation for these receptors.

Otter

- Overall, construction of the wind farm is considered to have had at most a slight, negative and short-term impact on any individuals which may have been using the site, and not believed to have had any significant effect on the local otter population in the area. However, this assessment cannot be justified given the lack of baseline information and valuation for otter.

Other mammals

- Pine marten slight negative and long term with no significant effect
- Red squirrel slight negative and long term with no significant effect
- Badger slight negative and long term with no significant effect

However, this assessment cannot be justified given the lack of baseline information and valuation for these species.

Offsite Peat Slide

Habitats

These seem under assessed, all impacts are not significant whether because of low value (such as conifer plantation) and/or because the habitats are widespread. While this is likely to be the case for the conifer plantation it would seem to be an under assessment for wet grassland.

Birds

Section 7.4.2.2.2 as the peat slide took place in October it is agreed that there is no nesting mortality and as a mobile species likely to have no mortality. However, the positive impact and no significant effect in the long term from habitat loss and significant positive effect of long-term duration considered due to habitat regeneration does not include and assessment of tree nesting birds or ground nesting birds due to the smothering of wet grassland.

Bats

Section 7.4.2.2.3 additional loss of 25 ha coniferous woodland is predicted to have no effect however conifer roosting potential is only considered for Natterers (permanent negative significant effect at the site level) this should be considered for all tree roosting species. This should also be applied to the original felling of confer plantation to facilitate the construction of the scheme. Henry Andrews Bat Roosts in Trees: A Guide to Identification and Assessment for Tree-Care and Ecology Professionals, 2018 (Ref 38) suggests that conifers that have roosting bat value. Also see Garry Mortimer Foraging, roosting and survival of Natterers bat in a commercial coniferous plantation (2016) (Ref 39).

Peat entered the upper reaches of the Owendalulleegh River and flowing along its length to Lough Cutra (approximately 22 km downstream). At the time of the event a visible plume was observed at the confluence of the Owendalulleegh River with Lough Cutra SAC. No impact on bats. However, the potential impact on foraging is not assessed.

Damage to three bridges considered to have potential for roosting for Daubentons and Brown long-eared, common and soprano pipistrelles. No effects were predicted on other bats.

There was no assessment of direct mortality from tree or bridge roosting loss.

It would be helpful to have some structure for assessment, for example "Valuing Bats in Ecological Impact Assessment Stephanie Wray CEnv FIEEM, David Wells CEnv MIEEM, Emma Long MIEEM and Tony Mitchell Jones MIEEM".

Otter

Section 7.4.2.2.4 predicted no effect of direct mortality as they are mobile, this assessment wasn't under any heading just in the introductory text. Reduction in food from fish kills assessed as being temporary to short-term and constituted a minor to moderate negative impact at the local population scale not likely to have had a significant effect. However, the fish kills from the peat slide were acknowledge so it is not sure how this assessment has been made.

Other mammals

In the same section pine marten and red squirrel are considered sufficiently mobile for there to be no direct mortality, slide occurred in October so impacts on young not considered likely, badger considered to have had the potential to be affected and setts lost but not considered to be there in high numbers (no badger surveys were carried out). The peat slide is therefore considered to have had a long-term negative impact, with no significant effect resulting on local mammal populations.

Assessment Summary

Greater detail is required as to the justification of the value of the individuals with clearly stated data limitations and precautionary assessment. Structured guidance on evaluation for all receptors should be clearly stated along with an evaluation statement for each receptor. For example, if determining that a receptor is common and widespread national data should be evidenced, assessment at a global scale should also be employed for receptors that are globally scared/rare.

Explanation as to the different assessment process applied for birds (have presumed Percival 2003 but this should be confirmed). Tabulation of impacts and impact pathways scoped in and out, assessed receptors with clear scoping in or out with justification would be helpful. Clearfelling of woodland to facilitate the development should be systematically assessed for all receptors. Habitat loss due to the development does not seem to have been assessed. Also, there should be a clear indication of assessment limitations and where precautionary assessments have been made.

5.8.5 Operation Assessment

Habitats

Occasional cutting back of re-growth of trees within the felled forestry areas prevents canopy closure occurring. As a result, the dominant heath / bog vegetation continues to occupy these areas. This is considered a minor positive impact of long-term duration as the habitat is of higher biodiversity value than a closed canopy conifer plantation that would otherwise have established in the area (significant positive effect). Conifer habitat adjacent felled to improve performance of wind farm but within the conifer felling cycle neutral impact and no significant effect.

No indirect effects are predicted from drainage. However, there is no assessment of vehicle movement, potential pollution via deposition, the effects that increasing the ease of access via access routes may cause such as degradation and disturbance due to recreation, increased hunting and or turbary.

Birds

- Birds section 7.4.2.3.2 reports that at the Derrybrien Wind Farm, there have been no documented collisions during the various surveys since 2006, though it is noted that carcass search was not part of the routine monitoring. However, in the absence of mitigation, the risk of collision with the overhead line is considered a potential negative impact which could be of significance. It is stated that "it can be demonstrated that hen harriers are at low risk of collision with wind turbines as a result of their typically low flight height" but it is not explicit in this section that there is no predicted impact from collision.
- Studies have shown hen harriers to still spend time foraging around the windfarm, it is considered that displacement of hen harriers from areas near turbines at Derrybrien has not been a significant impact and has not had a significant effect on the hen harrier population of the Slieve Aughty Mountains SPA. However, the large decline of Hen Harrier within this area was not mentioned in this section.
- Nesting – it is stated that there is no evidence to suggest that the wind farm has had any impacts on the reproductive output of the two regular hen harrier territories within a 1-2 km distance band.1 to 2km confirmed, none in 0 to 1km. Again, no mention of the decline in breeding pairs in this section and there is no assessment of potential disturbance for Hen Harrier or any other birds.
- Site not considered relevant to migrant birds.
- The replacement of non-native conifer plantation with an open sward is having a positive impact of long-term duration for birds including hen harrier, resulting in a significant positive effect for Hen Harrier.
- It considers that the maintenance of open habitats on site during the operation phase of the wind farm is likely to have had significant positive effect on breeding and summer bird species. Overall, it is considered that the removal of the trees is a positive impact of long-term duration for birds such as hen harrier which naturally forage over open habitats such as bog, heath and low scrub. However, only Hen Harrier and Merlin are considered other surveys have not been undertaken for operational monitoring, golden plover and red grouse are mentioned incidentally, along with "of particular importance is the frequency of meadow pipit, a Redlisted species, as well as skylark, mistle thrush, stonechat and linnet (all Amber-listed species)" a significant positive effect of the maintenance of open habitats is predicted on breeding birds, however, breeding and wintering birds should have been surveyed for and have been systematically assessed.

Bats

- Bats section 7.4.2.3.3 very low numbers of bat mortality quoted see table 7.20 below. However, the number of *Pipistrellus pipistrellus* killed annually in Britain in 2015 between mid-July and mid-October was estimated at 2,373 95% CI 513 to 4,233 and the number of P. pygmaeus at 3,082 95% CI 1,270 to 4,894. When compared to population estimates, the number of *Pipistrellus pygmaeus* killed was 57% higher than the number of *P.*

pipistrellus killed (0.19% of the population versus 0.43%, respectively). This may be due to *Pipistrellus pygmaeus* flying more often within the rotor sweep area compared to *P. pipistrellus* (Ref 41). Also, The National Bats & Wind Turbines Project (Ref 42) found casualty rates at wind farms in the UK to be variable, ranging from 0.00 to 5.25 bats per turbine per standard month, and from 0 to 77 bats per site per standard month. One soprano pipistrelle corpse was found during mortality surveys, confirming that bat mortality has occurred during the operation phase of the Derrybrien Wind Farm. However, "Searches were conducted on two consecutive mornings at 6 turbine locations (T11, T17, T18, T21, T27, and T71) on 31 August and 1 September 2016 to give an indication of bat mortality. During the survey the dogs were followed by the handler, who provided constant instruction. The dogs can effectively survey to 5 m either side of them when walking a transect." This would seem to be an under representation of monitoring compared to recommendations in Guidelines for Consideration of Bats in Wind Farm Projects.

Table 7.20: Summary of bat fatalities (high risk species) at wind turbines in the UK and Europe (total including UK figure).

Bat species	UK	Europe
Nathusius' pipstrelle	1	1564
Common pipistrelle	46	2362
Soprano pipistrelle	52	439
Leisler's bat	0	711

- For Nathusius', given the indicative size of the population in Ireland, a precautionary assessment is that the effect of mortality is likely to have a long term negative significant effect at the county level. However, the site was previously considered to be of negligible value to this IEF. These two statements do not seem congruous.
- The assessment concludes that it is likely that a long-term negative impact on common and soprano pipistrelle bats has occurred at site level between March 2006 and Mid 2020 and will continue.
- Also that Leisler's bat populations are likely to have a long term negative significant effect at the local level.

Otter

- Otter 7.4.2.3.4 suggested trout biomass would be restored from peat slide with no operational effect.

Other Mammals

- Offsite phased tree felling and replanting (approximately 46.2 ha in total) was undertaken immediately to the west of the wind farm site in 2016, 2017 and 2018 to optimise productivity of the wind farm. As previously these are considered to have had a short-term negative impact which would not have resulted in a significant effect on the local mammal population. However, these effects do not seem to have be systematically evidenced.

Long Term up to 2040

- Habitat maintenance no significant effect
- Birds no significant effect
- Bats same as previous
- Mammals including otter no significant effect

Summary

Operational effects are under assessed on habitats. Birds have been under assessed in general, and there is no assessment of the potential impacts from the potential increase in ease of access to the

site. The number of bat mortalities may be undervalued. The effect of the felling to increase the wind farm's efficiency does not seem to have been fully assessed.

Cumulative effects

Section 7.5.1 is titles cumulative impacts which have occurred but proceeds to consider everything *not significant.*

- Habitats - none however it acknowledges that turbary activities have increased it has not been assessed or discounted that the access tracks for the wind farm could have increased access to the area. It is recommended that this is further assessed.
- Birds - "While turf cutting by hand at the Derrybrien site has not resulted in a significant loss of habitat or a high level of disturbance, the recent mechanised cutting is of some significance in respect of both loss of foraging habitat and potential disturbance to foraging birds. It is concluded that mechanised peat cutting at Derrybrien, which is unrelated to the wind farm project, is contributing to an in-combination impact within the Slieve Aughty Mountains SPA." It goes on to say through that "However, it can be concluded that the operation of the Derrybrien Wind Farm project is not contributing to a negative in-combination effect when considered with turbary and peat extraction activities within the SPA." Increased ease of access has not been assessed.
- The Sonnagh Old Wind Farm is the only other wind farm within the Slieve Aughty Mountains SPA. This wind farm is located approximately 3.4 km to the northwest of Derrybrien. It is concluded that this has no cumulative effect, however, monitoring has not been requested at Sonnagh so this would seem not be a conclusion based on evidence. Again, no mention of the large decline in Hen Harrier populations has been mentioned.
- It is acknowledged that there is potential for OHL to have resulted in a cumulative impact in the absence of mitigation of moderate significance for Hen Harrier, other birds are not considered.
- Bats no effects from turbary, collision, or coniferous habitat loss, the damage and repair to three bridges is considered to be a permanent negative significant effect at the site level for common pipistrelle, soprano pipistrelle, Natterer's bats and Daubenton's bats but no cumulative effects predicted.
- Mammals slight temporary and localised negative impacts predicted, there is no impact predicted for otter despite the acknowledged fish kills and significant los of biomass for a number of years.

There is a further section titled Cumulative impacts which are likely to occur (section 7.5.2).

- Habitats - acknowledgement of turbary potentially causing destabilisation and that mitigation is in the Soils, Geology and Land section. The Chapter then goes on to say that "Turbary activities are removed from and do not impact on the intact areas of upland blanket bog within the wind farm site (highest quality peatland habitats) and therefore there are no cumulative impacts on this habitat predicted."
- For birds it refers back to the previously discussed section saying the previous cumulative effects would persist but the previous sections assessed no cumulative effects, with the exception of moderate significant effect for Heh Harrier. This should be stated.
- Bats no cumulative effects on Lesser horseshoe bat, whiskered bat, Daubenton's, natterers and Brown long-eared.
- For common and soprano pipistrelle, Long term negative effects significant at the site level

A more structure cumulative effects section would be helpful with impacts and impact pathways clearly scoped in and out. Also a more evidenced based assessment is required.

5.8.6 Response to Stakeholder Concerns

There is no section on consultee responses in the Chapter. From the information provided the following comments were noted, the comments of Mr Collins were more extensive but these are the key concerns.

Consultee	Contact	Date	Comment
Duchas Heritage Service	Patrick White	1998	Insufficient information for the impacts due to peat impacts on Lough Cutra SPA CSAC Coole-Garryland Complex Effect on freshwater pearl mussel should be checked. More information on Hen Harriers More information on breeding versus migratory birds
Duchas Heritage Service	Joanna Modzcklewska	2001	Hen Harrier and Merlin identified but no breeding birds surveys caried out. Hen Harrier of particular importance re Slieve Aughties. Requested a complete survey for breeding birds using Hen Harrier Survey methods.
Member of the public	Martin Collins	2020	The fact that the 2015 National Survey of Hen Harrier in Ireland by the National Parks and Wildlife Service the population in the Slieve Aughties has shown a dramatic loss of almost 50% since 2005. Even more alarming is the fact that recently the Hen Harrier Project Annual Report Year 3; May 2019 – April 2020 stated that: "The Slieve Aughty Mountains straddles the Galway and Clare border and is the 2nd largest SPA in the network. This SPA supported 27 territorial pairs of breeding Hen Harrier in 2005, however since then the population has undergone catastrophic decline. There were just six confirmed territories recorded during surveys in 2019 and one possible territorial pair, which marks a 75% drop in numbers over the last 15 years. Four of the six confirmed pairs were successful in fledging a total of seven young. In spite of the continued decline in the number of breeding pairs the number of young birds fledged shows an increase over previous years."
Member of the public	*Martin Collins*	*2020*	The fact remain that No planning permission and No *EIA were produced for deforestation of 263 ha in* direct contravention of Irish and EU law.

5.8.7 Effect of Decommissioning

- **Habitats temporary minor but no significant effect**
- **Bats minor negative effect due to localised disturbance, this doesn't seem in proportion to the previous assessments of no significant effect on bats due to much larger areas of habitat removal and disturbance due to the construction and peat slide.**
- **Otter, while intermittent localised disturbance may impact a small number of foraging male otters in the winter-spring period while foraging for frogs, this is expected to have at most a slight, negative and short-term impact with no significant effects.**

- Other mammals activities on site are likely to cause localised disturbance to mammals such as pine marten and badger which may use the site for foraging purposes. This is expected to have at most a slight, negative and short-term impact with no significant effect.

5.8.8 Effectiveness of Proposed Mitigation Measures

There is little mitigation or monitoring proposed.

- Terrestrial habitats, none proposed following emergency peat slide mitigation, in the original ES avoidance of the most sensitive habitat and floating roads were used to avoid impacts, monitoring is not mentioned.
- For birds monitoring of Hen Harrier will continue at 3 year intervals and flight diverters will be erected on the OHL but no other bird monitoring is proposed. Pre decommissioning surveys for Hen harrier prior to works, other are birds not mentioned. More Vantage Points *(a minimum of 4) would be recommended to cover this area.*
- Bats 2 bat boxes erected to each of the three damaged bridges, there is no mention of potential loss of tree roosts. A curtailment scheme will be implemented to stop turbines when temperatures are above 11 degrees and wind speed is below 5m/s between dusk and dawn each night. Carcass searches will be undertaken for 3 years in spring, summer and autumn. No other bat monitoring is proposed. A suite of statics throughout the year to monitor how the operation of the windfarm affects bats would be helpful. It would also be helpful to monitor the success of additional roosting provision.
- No monitoring for mammals, pre decommissioning surveys for otter should be undertaken.

5.8.9 Recommendations for Further Mitigation Measures

An overarching management and monitoring plan should be written, detailing the receptors, surveys, years of survey and management required over the years up to decommissioning, this should include but not be limited to.

- Consideration of the impact of greater access has had on turbary and other potential impacts such as hunting, recreation etc.
- There is no management or monitoring plan for habitats, it is recommended that habitats are managed to reach maximum positive condition and to plan for decommissioning to *avoid degradation of the best habitats.*
- There is no monitoring proposed for birds other than Hen Harrier, for which additional VPs should be added. Merlin are under reported. Breeding and wintering bird surveys should also be undertaken.
- The SPA is clearly failing in its conservation objectives, further interventions of positive management for Hen Harrier and Merlin should be produced to link in with the overall habitat management plan suggested above.
- There is no monitoring proposed for amphibians or common lizard, it is recommended that *some monitoring is undertaken to inform decommissioning.*
- Bat monitoring using a suite of static detectors should be undertaken throughout the season to monitor the effect of the windfarm on bat foraging.
- Pre decommissioning otter surveys should be undertaken across the site and with appropriate buffers on the study area.
- Additional mitigation or compensation should be provided or considered for the following:
- Compensation for loss of habitat for red squirrel, pine marten, badger and nesting birds should be considered.
- *No mitigation has been proposed for bats for the loss of coniferous forest as a roost and/or* foraging resource, compensation should be provided. Two bat boxes for the potential loss of bridge roosting habitat do not seem sufficient. A minimum of three bat boxes should be erected either within each bridge or on suitable trees nearby.

5.8.10 Additional Information or Evidence Required

The rEIAR is incredibly difficult to follow and the difficulty in reading and interpreting the assessment may give greater doubt as to its veracity. It would benefit from greater structure use of tables and clarity of the assessment process. Greater evidence is required for all receptors. Additional survey data should be captured for breeding and wintering birds and foraging bats. Limitations from best practice should be clearly stated per receptor. Alternative methods of assessment should be cited to address limitations where historic data is not available.

There are instances where results, impacts and mitigation are mixed. Tabulated surveys and survey effort, a clear preconstruction baseline, a list of impact pathways and receptors scoped in and out, evaluation and impact assessment tables would be helpful.

Clear scoping of receptors and impacts/impact pathways should be stated.

Habitat loss does not seem to have been assessed. Some receptors seem to have been undervalued and impacts also undervalued. Assessment of the increased access the new road system may have on disturbance and degradation due to recreational impacts, increased hunting, increased turbary and potential pollution via atmospheric deposition have not been assessed.

Other birds other than Hen Harrier are under assessed.

The effects of clearfelling large areas of conifer have not adequately been assessed on roosting bats, red squirrel, badger, pine marten or nesting birds.

Cumulative effects assessment has not been clearly evidenced.

There is no section on consultee responses, there should be a summary table detailing how concerns have been addressed.

Additional mitigation and monitoring should be proposed as set out in section 5.8.9 recommendations for further mitigation measures.

5.8.11 Reasonableness of Conclusions and Need for Possible Remedial Works

The rEIAR is incredibly difficult to follow and the difficulty in reading and interpreting the assessment may give greater doubt as to its veracity. More evidence is required to justify the conclusions. Additional information should be gathered and an assessment undertaken that is clearly structure as set out in section 5.8.10. Additional mitigation and monitoring should be provided as presented in section 5.8.9.

5.9 Aquatic Ecology and Fisheries

5.9.1 Compliance with Legislation and Best Practice

There is an extensive list of desk study data provided within section 8.1.3.2 however there is no listing of relevant legislation or policy. While some legislation is incorporated throughout the report a dedicated section would be helpful.

An assessment under the Water Framework Directive has not been undertaken nor one under the Eels Regulations.

EPA guidelines (2017) are cited and followed, however it should also have included impact assessment guidance such as CIEEM guidelines 2019 (Ref 25). The NRA (2003) guidelines cited are not an appropriate assessment method.

Other guidelines are peppered throughout the document it would be useful to have these listed in the method section.

There is no scoping process which makes the document difficult to follow. There is limited liaison with the with the competent authority.

5.9.2 Baseline Information

The baseline includes river catchments, geology and soils, sub catchments and landuse, biological quality, water chemistry and Fisheries. Freshwater pearl mussel are mentioned within the baseline within section 8.2.1 River Catchments. "The Graney River has a historic record of the freshwater pearl mussel (*Margaritifera margaritifera*) from the 1920's. However, that record was from the lower reaches of the river i.e. downstream of both Lough Graney and Lough Atorick and there have been no records since." This species should have been presented as an individual receptor.

The information is presented in a very academic way. Tabulation of each receptor baseline and valuation would help the reader navigate the large blocks of text.

There is impact assessment within the baseline for example within section 8.2.4 Biological Water Quality "The data selected begins in 1996 several years before commencement of the wind farm construction and continues until 2019. It also includes the data for 2003, which was surveyed within one month of the peat slide. Throughout this period of 23 years, all of the main channel sites have returned High Status results of Q4-5 or Q5. The only exception was in 2003 when sampling was undertaken exactly one month after the peat slide at the wind farm and where the previously High Status dropped to Bad (Q2) at the site closest the slide (5 km d/s) i.e. EPA O5, improving gradually in a downstream direction through Moderate Status (Q3-4) at EPA O4 to Good Status (Q4) at sites EPA O3 to O1, as the amount of peat silt in the channel diminished in a downstream direction (Clabby et al., 2004). In the next round of sampling in 2006 there was no evidence of an impact from the 2003 peat slide, at four out of five of the survey sites (EPA O2 to O5) which were all High Status. The exception was EPA O1 at Killafeen Bridge which is the farthest site downstream from the wind farm where Good Status (Q4) was recorded. These data indicate that the impact of the 2003 peat slide on biological water quality on the main channel of the Owendalulleegh River was short-term, with pre-slide conditions resuming within 3 years (at most) and remaining essentially the same since."

This is useful information but should be in the impact assessment section of the document. These results of the water status should be tabulated in the desk study or results sections.

A separate survey methodology section separate from the baseline results would also help navigate the section.

It is worth noting the recorded absence by '*rEIAS, Section 8.2.6.3*' of fish species within the small tributaries feeding directly from the windfarm. Grieve & Gilvear (2008) (Ref 43) noted elevated levels of Dissolved Organic Carbon and markedly elevated levels of suspended sediment in streams associated with windfarm development on blanket bog. Meanwhile Waldron et al. (2009) (Ref 44) demonstrate increased aquatic loads from a windfarm constructed on partially-afforested blanket bog, which they suggest "*...may reflect continued disturbance propagating downstream with time...*" They go on to observe: "*The consequence of changing nutrient stoichiometry of receiving waters on riverine carbon efflux is an aspect that does not appear in environmental impact statements to be given consideration.*"

Under Section 8.1.4 Difficulties Encountered it is noted that "the main difficulty encountered was the lack of baseline macroinvertebrate, fisheries or water chemistry data for any of the many small streams which drain the Project area. In addition, except for triennial EPA data on Q-values at several sites on the main channel of the Owendalulleegh, Boleyneendorrish and Duniry Rivers, which have proven crucial in the current assessment, there was also a lack of baseline data for these main channels into which the minor streams draining the wind farm and much of the OHL corridor flow. There is a similar paucity of baseline fisheries, ecological and water chemistry data for Lough Cutra, into which the Owendalulleegh flows as its main inlet river, in the years immediately prior to, during and immediately after the peat slide. Moreover, there were very limited follow-up fisheries, water chemistry or macroinvertebrate surveys carried out in the years immediately following the commissioning of the wind farm, especially given the occurrence of a very large peat slide during the construction. This has made it difficult to assess the speed of recovery of the ecological status and fish populations in some watercourses impacted by the 2003 peat slide. During the original EISs for phase 1, 2, and 3 of the wind farm, water quality assessments of the nine small subcatchment streams draining the wind farm footprint were not carried out. Despite these constraints it is considered that the data available,

including the data collected during field surveys as part of the current study, is adequate to address this assessment."

Given the absence of any meaningful EIA of the freshwater systems prior to the start of construction, and given the admission in '*rEIAS, Section 8.1.4*' that only limited data sources were identified by the current assessment for conditions preceding the peat slide of 2003, it is difficult to justify the concluding statement of '*rEIAS, Section 8.1.4*': "Despite these constraints, it is considered that the data available, including the data collected during field surveys as part of the current study, is adequate to address this assessment."

Moreover, raising questions about the extent to which pre-peat slide information was sought, the Reference list for Chapter 8 does not, for example, include key papers about the brook lamprey *Lampetra planeri* (an Annex II species under the Habitats Directive) in Ireland by Kurz & Costello (1999) (Ref 45), Byrne et al. (2001) (Ref 46) or by Kelly & King (2001) (Ref 47), the latter reference, and the importance of brook lamprey *L. planeri* within the Owendalulleegh catchment and Lough Cutra, being highlighted by Lindsay & Bragg (2005) (Ref 48).

Brook lamprey *L. planeri* are non-migratory and thus would be slower to recolonise a damaged river system than the other two lamprey species, or highly migratory species such as the eel. Had the EIAs undertaken between 1998 and 2001 been of adequate quality they would have included an assessment of the fish populations in the river systems fed by streams arising within the orbit of the development. As it is, the absence of such pre-development data makes it difficult to judge the significance of lamprey data in the Owendalulleegh obtained between 2009 and 2019. The low number of lamprey recorded, however, particularly when contrasted with species such as eel and trout, could be cause for concern and merits a cautionary assessment. An explanation for low lamprey numbers, given in '*rEIAS, Section 8.2.7*', does not match well with the description of habitat preferences for the two stages of the brook lamprey life cycle given by Kurz & Costello (1999) - which is not referred to in '*rEIAS, Chapter 8*'.

5.9.3 Appropriateness of Assessment Methodology and Significance Criteria

The valuation of receptors is based on NRA guidelines from 2003, these were designed for roads and seem to refer largely to fisheries not to nature conservation status. These do not seem like an appropriate evaluation criterion, instead one should use impact assessment guidance such as CIEEM guidelines 2019 (Ref 25).

Section 8.2.7 on Ecological and Freshwater Value is very difficult to follow. The use of the NRA 2003 guidelines seems that the water bodies are assessed but not the faunal or floral species they support. However it seems to be a blend.

For example, the following is difficult to unpick

- "there is a healthy population of brown trout in the Owendalulleegh and the Boleyneendorrish main channels and some of their tributaries with excellent salmonid habitats and in this regard, they can be classed as C: High value locally important/County importance."
- Then for lamprey and eels "It is worth noting that both these species are more cryptic than trout so that their numbers in the three electrofishing surveys are probably slight underestimates at some sites because highly coloured water, deeper sites and, in the case of eel especially, very coarse substrate make them more difficult to capture. For these 2 species the Owendalulleegh can be classified as category D, Moderate value, locally important/Local importance (higher value)".

This would lead one to think the assessment was for individual fish receptors however the section goes on to say

- "The habitats are generally ideal for salmonid fish with riffle, glide and pool sequences in many parts of the system. This fact, coupled with the consistent High Status Q-ratings of the water quality as reported by the EPA along the main channel for in excess of 20 years, means that overall these habitats can be classed as of category C (High Value Locally Important/County Value). However, given that the number of High Status river water bodies

in Ireland has fallen by nearly a third (91 water bodies) since the baseline assessment in 2007-2009 (EPA, 2019) this highlights the importance of the main channels of both the Boleyneendorrish and the Owendalulleegh in a regional and national context. This assessment is further supported by the knowledge that the highest quality biological sites (Q5) show no sign of recovery nationally, having fallen from 13.4% of sites in 1987-1990 to only 0.7% of sites in (2016-2018). Indeed, the number of Q5 sites currently stands at 20 in the whole country (EPA, 2019). Of these, in 2018, 2 were present on the main channel of the Owendalulleegh and 1 on the main channel of the Boleyneendorrish, raising the ecological value of these channels to level B on the table namely to National/Regional importance."

So is the conclusion that the Boleyneendorrish and the Owendalulleegh are of National/Regional importance, if so which one? National or Regional? This is followed by:

- "Most of the larger tributaries draining the Derrybrien Wind Farm e.g. B2, B3 and B4, O5A O6A, O9A and D1 can be considered of High Value Local Importance (Category D) having mainly Good or High Status water quality and good brown trout habitat. Smaller upper tributaries including B1A, B4B, B4C, D1A, O1-O5, OHL 1 and OHL2 are of Moderate or Low ecological value by virtue of their generally smaller size, limited fisheries habitats or occasionally less than Good water quality falling somewhere between category D and E." This does not however cover all of the water courses sampled of which there are 19 in total. This would be better tabulated for clarity.

Then Lough Cutra and Lough Atorick are assessed as

- "Lough Cutra is classed as of international importance as a Special Area of Conservation (SAC) and Special Protection Area (SPA) but not for water based conservation objectives. Its status as a regionally important pike fishery, its eel population, combined with its size and generally Good Ecological status would suggest that it is of at least category C status i.e. High value, locally important/County importance.
- Lough Atorick which hasn't any WFD ecological status as yet assigned to it can be described as category D (Moderate value, locally important), as it is likely to hold a stock of small trout and have at least Good Ecological Status."

It would be appropriate to assess the faunal receptors fish and fresh water pearl mussel separately. There should be a section on the nature conservation status of each receptor and an appropriate evaluation of each one.

Suspended Solids – Impacts on Macroinvertebrates & Water Quality assessed "as being of moderate, negative but temporary to short-term impact on the water quality of the small streams draining from the wind farm" but this is not evidenced by Table 8.24 Predicted impacts which presents a decline in quality attributed by Q values on 14 out of the 26 values cited up to 2006, this does not evidence a return to previous water quality. Table 8.10 presents Q values from 2011 to 2019, these sample sites do not all appear analogous but show a continued decline for many sample sites.

Suspended Solids – Impacts on Fish "To conclude therefore, the impact which washout of mineral and organic solids from the wind farm construction had on fish in the receiving water courses (as opposed to invertebrates) is believed to have been at worst, slight, negative and temporary to short-term in duration." This is not evidenced.

Projected Changes in Water Quality due to the Construction Phase, this section suggests that the "The analysis has also taken into account the fact that the 2003 peat slide probably completely wiped out the macroinvertebrate communities all down through SC7(b) subcatchment (Site O4 and O5) and its downstream continuation, SC7(d) (Sites O6 and O6A), which would have completely masked any impact of clearfelling on the site or on the OHL corridor, as well as any wash-out of solids associated with on-site construction activities, all of which would have been expected to have been slight or moderate negative and temporary to short-term in duration."

"In conclusion, the impact on macroinvertebrates in the streams and rivers as listed in Table 8.24, outside of the SC7(b) and SC7(d) subcatchment (dealt with in Section 8.3.2.2), can be described as (i) no impact: O1, O2, B5 and D1, (ii) very slight negative and temporary: B1A, B2, D1A, OHL1 and

OHL 2, (iii) slight, negative, temporary to short-term: B4, O3, O8A, O9A, O9A1, O9A2, O9B, (iv) moderate, negative, temporary to short-term: O3A, B2A, B4B, B4C. Overall, the impacts of the construction phase of the wind farm site on fish can be categorised as a neutral to slightly negative, and temporary to short term in duration." From the information presented in Table 8.24 this isn't possible to evidence. Evidence from wind farm applications in the wider area would be helpful to support this assessment.

Under the OHL and Agannygal substation and associated works no significant impacts are predicted although Q values in Tables 8.10 and 8.24 show decreasing Q values.

Peat Slide

The assessment states that "In terms of Ecological Status and water quality these impacts indicate that the entire channel of subcatchment SC7(b) and SC7(d) were probably wiped out and that the first 1 km downstream from the confluence of SC7(d) with the main channel of the Owendalulleegh as far as EPA O5 was similarly impacted with a drop from High Status (Q4-5) down to Bad Status Q2 (Table 8.8) This can be described as a profound negative impact, of short-term duration. Over the following 5.7km downstream to EPA O4, the water quality dropped from High Status (Q5) to Moderate Status (Q3-4) which can be described as a very significant negative, short-term impact. In the next 7.2km downstream from EPA O4, to EPA O1 (1.5km upstream of Lough Cutra), the Q-rating fell from High Status (Q5 and Q4-5) to Good Status (Q4), which can be described as a significant to moderate negative impact, of short-term duration. As the EPA valued sites do not relate directly to the sites surveyed it is difficult to confirm this assessment particularly when comparisons between tables 8.24 and 8.10 show a long term decline in Q values for some sites that do not recover by 2019.

With regards to fish "There are no records of the fish density in the river prior to the peat slide and no systematic follow-up surveys were undertaken in the years immediately following the event, so that it isn't possible to know with any degree of accuracy the numbers of fish lost due to the peat slide nor the rate of recovery in the very early years after the event." The assessment then predicts very significant negative effects in the short term or medium term. The potential for habitat loss is discussed in terms of spawning capacity but is then dismissed as due to the naturally patchy nature of the suitable spawning habitat as therefore being a slight negative in the short to medium term. Given the lack of data and the numerous extrapolations and professional judgement taken on the assessment it would be useful to have a precautionary assessment with confidence in the assessment stated.

The section is very difficult to follow and would benefit from greater structure and a clear narrative per receptor.

Operation

"In April and May 2014 many parts of the floating road system on the wind farm needed to be repaired and upgraded due to wear and tear. These remedial works were assessed in detail in 2013 as part of an Appropriate Assessment screening process for the works and included recommendations for silt control mitigation on any of the drains likely to receive silt run-off from sections of the track ear-marked for repair. While no targeted follow-up assessments were undertaken after these works, the assessment at the time concluded that the silt control measures would have been sufficient, given the nature of the works and the gently sloping terrain, to prevent any downstream impacts on the ecology of the receiving waters caused by solids runoff." However, it is noted that a fall in Q values at sites O4 and O5 could have been attributed to maintenance activities but that "If this was the source of the impact it can be described as slight to moderate, negative and short-term on invertebrates, and slight, negative and short-term on fish in affected tributaries."

On site drain cleaning "could generate suspended solids which could have a negative impact on fish spawning in the streams draining the site if silt were to accumulate in spawning beds during the spawning or hatching periods in winter and spring. Depending on the extent of such an effect the impact could range from slight to moderate, negative, temporary, in affected tributaries".

Tree growth cut back "These actions could potentially generate increased nutrients and suspended solids. However, their limited extent and dispersed nature strongly suggest that any impacts in

receiving waters will either be negligible or slight, negative and temporary and in most if not all cases unlikely to result in a change of ecological status in the receiving waters downstream."

Turbulence felling in SC9 is therefore thought to have given rise at worst to a slight, negative, temporary impact on macroinvertebrates. However, there were subsequent declines in Q values are thought possibly to be connected with clearfelling rather than the turbulence felling. Although "A water sample taken at the base of SC8 (O8A) in August 2019 returned the highest SRP (i.e. Soluble Reactive Phosphorous) value of any site sampled (0.214 mg/l) and it is considered unlikely that all of that was contributed by felling in the upper catchment. At around the same time a Q-rating of Q3-4 was recorded at the same site. However, it is doubtful that this can be attributed in its entirety to the clearfelling in the catchment carried out in 2017 and 2018. Overall therefore, it is believed that the 46.2 ha of turbulence felling undertaken between 2016 and 2018 across 4 subcatchments probably did give rise to an increase in nutrient runoff (as SRP primarily) but had at worst only slight negative and temporary impacts on ecological status at sites lower down in the subcatchments in question."

These sections are very difficult to follow, there are presented a number of confirmed impacts that are thought to be due to turbulence felling.

It would seem that more regular monitoring and consistent monitoring of sites is required to confirm the short term predicted duration of maintenance activities on the site.

5.9.4 Response to Stakeholder Concerns

There are no stakeholder concerns presented within the document. Freshwater pearl mussel were a key stakeholder concern. These species appear to have been scoped out of the assessment but should be scoped out in a structured way with clear evidenced based reasoning.

5.9.5 Effect of Decommissioning

The assessment for decommissioning assumes slight or moderate impacts even without mitigation. Given the previous peat slide incident this may be a potential under assessment of impact. Unforeseen incidents should also be assessed.

Track widening "Properly planned and supervised, these activities should have at most minor, negative and temporary impacts on downstream watercourses close to the wind farm boundary. The impacts would be confined mainly to aquatic invertebrates with the possibility of slight negative impacts on spawning success in the streams concerned, depending on the degree of siltation. This latter effect would not be expected to extend into the main channel of any of the 3 main channels draining the site."

Crossing of the Owendalulleegh by vehicles for the OHL and substation decommissioning "This was the same route used during the installation of these three structures. In terms of average density, we know that this crossing point holds about 0.3 trout and 0.1 stone loach per m2 which would suggest that about 5-6 trout and about 2 stone loach, on average, might be present in a 3.5m wide corridor at a point where the river is about 5m across and that number of fish could be killed at the crossing due to vehicular traffic. These figures could be higher however if there were frequent over-and-back trafficking. Were this to be the case the impact could be described as slight to moderate, negative and temporary."

"Where the ground falls more steeply toward channels at Black Road Bridge (Site O4) and Flaggy Bridge (Site O5). In fact, to some extent the latter could be an issue at any point along the route where very minor drains could allow contaminated surface run-off to reach one of the larger drainage channels along the route. These activities could lead to slight negative and temporary impacts in some of these watercourses, mainly in the form of changes to the relative abundance of some aquatic macroinvertebrate groups favouring less sensitive groups such as chironomids."

For the Removal of Barrages 3 and 4 "The proposal is to remove the boulders that form the main structure of the barrages and to also remove the finer material which has accumulated behind the structures. It is imperative that all the softer material is removed in its entirety before the boulders are removed because otherwise it could release suddenly under the weight of gravity and the force of the water upstream, potentially constituting a significant debris slide which in a worst-case scenario could

cause a fish kill downstream. Although such a fish kill, were it to occur, would only impact the first approximately 1 to 2 km downstream of the barrage sites, the potential impact would still be described as a moderate to significant negative, localised and short-term impact"

"If this is undertaken without mitigation, the downstream impact can be described as slight or moderate, negative, temporary, affecting the ecological status of the SC7(b) channel at Site O5, possibly dropping from Q4-5 or Q4 to Q3-4. There could also be a slight negative and temporary impact on spawning in the lower part of the subcatchment around Site O6A, depending on the amount of solids generated by the works, resulting in a slight reduction in trout fry recruitment at the site. Both these impacts would be localised within the SC7(b)/(d) subcatchment."

Cumulative effects

Of Turbery "the cumulative effect, had it occurred at all, could be described as slight to moderate, negative and temporary in terms of potential impacts on macroinvertebrates and slight, negative and temporary in terms of impacts on fish in the two affected channels.

Of Clearfelling "Had these occurred at the time they would have been slight to moderate, localised, and temporary to short-term in duration."

Of Planintg in lie of felling on wind farm site was considered to have no negative effect.

Ennis-Shannonbridge Over Head Line reinstatement "is likely to have a worst, a slight, negative and temporary impact on the water quality in small drains between the Agannygal Substation and Lough Atorick"

No other cumulative effects are predicted.

The overall assessment of cumulative effects is that "The assessment has already indicated that ongoing maintenance on the Project i.e. both on the wind farm site itself and along the OHL corridor until the end of the operational life, will give rise to intermittent, slight to moderate, negative, impacts, with these impacts confined to the minor streams draining the wind farm site, the OHL corridor and Agannygal Substation. On-going annual turbary activity on the wind farm site will contribute to these impacts as they occur but will not cause them to increase to a higher level of significance. The same can be said for the decommissioning phase of the Project including within the wind farm site, along the OHL corridor, Agannygal Substation and in connection with the removal off-site post slide remedial measures (Barrages 3 and 4) and therefore any cumulative impacts will not be significant."

5.9.6 Effectiveness of Proposed Mitigation Measures

There is a suite of proposed mitigation measures recommended for the decommissioning. These include pump over systems, work during dry weather, bog mats, silt control measures, fish rescue and protection, minimising and demarcating working areas, and the potential installation of a baily bridge. A pollution control officer should also be appointed for decommissioning.

For maintenance it is recommended that this is detailed in advance n an annual basis and sent for assessment to a trained aquatic ecologist for approval. Dry weather working is recommended with the use of bog mats. Removed material must be safely stored so that it does not enter the water course. Sillt fences should be erected for drain maintenance

However no guidance is cited. No monitoring is recommended.

5.9.7 Recommendations for Further Mitigation Measures

Best practice guidance should be cited for mitigation. The formation of a management plan is welcome for the maintenance, this should also be overseen by an appointed pollution control officer. In addition to mitigation for required maintenance, positive management and enhancement should be implemented. Yearly monitoring of the water courses should continue, annual monitoring of the site in general should be included to ensure that appropriate management is being undertaken. Method statements for the decommission should also be drawn up in advance. An assessment under the Water Framework Directive and under the Eels Regulations should be undertaken for the

decommissioning even in the form of a pre screening with recommendations for a detailed assessment to be undertaken prior to decommissioning.

5.9.8 Additional Information or Evidence Required

Compliance with legislation and policy should be cited. A list of guidance followed should be provided.

An assessment under the Water Framework Directive has not been undertaken nor one under the Eels Regulations. These should be undertaken for the decommissioning, even in the form of a pre screening with recommendations for a detailed assessment to be undertaken prior to decommissioning.

Key papers about the brook lamprey *Lampetra planeri* (an Annex II species under the Habitats Directive) in Ireland by Kurz & Costello (1999) (Ref 45), Byrne et al. (2001) (Ref 46) or by Kelly & King (2001) (Ref 47), the latter reference, and the importance of brook lamprey *L. planeri* within the Owendalulleegh catchment and Lough Cutra, being highlighted by Lindsay & Bragg (2005) (Ref 48) should be examined. In general a predicted baseline pre construction should be estimated and precautionary or extrapolated data clearly stated.

Each receptor should be systematically presented and the nature conservation status provided to form a valuation for each receptor. Each receptor should be systematically assessed and it should be clearly stated when professional judgement is used in the absence of data what the confidence in that data is. There should be a clear, structured narrative which presents the baseline per receptor, scoped receptors in/out of the assessment, predicts the impacts (with precautionary assessment or professional judgement with confidence levels stated). The valuation of receptors is based on NRA guidelines from 2003, these were designed for roads and seem to refer largely to fisheries not to nature conservation status. These do not seem like an appropriate evaluation criterion, instead one should use impact assessment guidance such as CIEEM guidelines 2019 (Ref 25).

Additional mitigation should be included as stated in Section 5.9.7.

5.9.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The impacts may be underestimated, due to the lack of existing data. This is however difficult to judge and reliance on professional judgment is necessary. By incorporating the amendments and additions outlined in Sections 5.9.7. and 5.9.8 this would provide more confidence in the current and future impact predictions and in the success of mitigation.

5.10 Landscape and Visual

5.10.1 Compliance with Legislation and Best Practice

The standard list of guidance documents have been listed in chapter 9. These were all applicable and current in 2020. The Landscape and Visual Assessment generally conforms to LVIA guidance and has been informed by several key guidance documents including Guidelines for Landscape and Visual Impact Assessment (GLVIA), 3rd Edition 2013 and Guide to Visual Representation of Wind Farms (Scottish Natural Heritage, 2017).

However, the apparent absence of a scoping process and liaison with the competent authority on matters such as extent of study area, key receptors and viewpoints that would need to be assessed carefully as recommended by the GLVIA (Ref 49) departs from best practice.

5.10.2 Baseline Information

The LVIA establishes what the baseline was in 1998 and is appropriate and adequate for the assessment purposes. The viewpoint photos and maps provided as part of the baseline reporting is adequate.

5.10.3 Appropriateness of Assessment Methodology and Significance Criteria

The assessment methodology is standard and the significance criteria set out in Table 9-3 is generally appropriate. While it is acknowledged that LVIA guidance does not provide a prescriptive LVIA

methodology and relies on practitioners to develop their own specific methodologies based on the characteristics of the development proposal at hand and the landscape in which it is located, combined with professional judgement and experience, there seems to introduction of an additional layer or effect which would make 'moderate effect' not significant. Moderate effects are generally significant and it is surprising that a very large wind far development of 70 turbines would not have a single significant effect.

The proposed development is a very large wind farm and therefore likely to have some if not a complete absence of any significant effects. There is a slight lack of clarity with regard to visual effect significance and is evident in some form in the assessment section. For example, for viewpoint 14, which is of high sensitivity as it is acknowledged this is along a waymarked walking trail and has considerable scenic qualities and long distance views. However, the magnitude of change is considered to be low to medium even though it is recognised the turbines occupy a considerable proportion of the view. The visual effects are reported to be Slight to Moderate and surprisingly neutral visual effect. Similar assessment has been reported for Vp15 as well. The definition of 'Neutral' is defined as a scheme that complements the scale, landform and pattern of the landscape/view and maintains landscape quality. This is certainly not the case in the current landscape which has 70 large turbines.

Similarly, landscape significance seems to be allocated to effects above moderate effect rather than moderate and above which is more usual as stated before. The overall effect on Landscape from construction phases 1&2 is identified as a temporary "Moderate adverse", however this is deemed "not significant" in accordance with the methodology and table 9-3.

In addition, there seems to be no discussion of study area and the ZTV figure is limited to 25km which is not entirely unreasonable but one would expect the rationale for this limit to be set out. Viewpoint 12 – Terryglass harbour is just outside this limit however it is included as a viewpoint and there is no rationale for its inclusion. While it has been reported that 16 number of viewpoints have been carefully selected, there is no justification as to why these viewpoint locations have been selected and the category or group they represent.

Typically, as good practice the viewpoint locations would include a range of views to include various types of receptors such as residential, recreational, road users who would experience the landscape in different ways. In the assessment almost all views that have been selected are from roads which are transient in nature and therefore inherently significance of effects for such viewpoints would be lower. While it has been mentioned that there is relative lack of scenic amenity and recreational use in the Slieve Aughtys there could be other areas in the 25 km which could have been identified for viewpoint receptors. If this is not the case the assessment should clearly state these. The report mentions that there are a small number of rural houses on the fringes or outside of Derrybrien (to the south), Ballynakill (to the east) and along the local road to the south of the site, which do have views of the wind farm. However, these have not been included in the assessment.

There is also no mention of alternative siting/layouts considered and how/if landscape and visual issues have informed the layout and avoided visibility from certain locations. The turbines are tightly clustered and visual stacking does occur as it is a very large wind farm.

The ZTV sets out the visibility of the hub height rather than the blade tip height which is more usual. Even if the hub is below the skyline the appearance of a turning blade can still have a visual effect. It is best practice for two ZTVs to be produced for windfarm projects – one showing hub height ZTV and another showing blade tip height.

All above points are examples where there are instances of lack of clarity and conflicting professional judgement on the use of methodology.

5.10.4 Response to Stakeholder Concerns

There is no reference to stakeholder consultation at all. It is not apparent that a consultative scoping process has been undertaken and the apparent absence of a scoping process and liaison with the competent authority departs from best practice as the scoping opinion represents the considered view

of the competent authority and concerns of stakeholders on matters such as extent of study area, key receptors and viewpoints that would need to be carefully assessed.

There is also no mention of stakeholder input/agreement into methodology.

This appears to be a significant flaw in the LVIA.

5.10.5 Effect of Decommissioning

This is explored thoroughly.

5.10.6 Effectiveness of Proposed Mitigation Measures

No mitigation measures are proposed, and justification has been based on the absence of any significant effects.

5.10.7 Recommendations for Further Mitigation Measures

There is perhaps a missed opportunity to explore ways to assist the natural regeneration of the site following decommissioning given the fact that this is a very large wind farm development.

5.10.8 Additional Information or Evidence Required

There is no evidence of any liaison with stakeholders – particularly the Local Authority and other stakeholders/residents etc. This is an important part of to the process to consider their views and interests on a number of matters.

5.10.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The conclusions appear reasonable however the apparent absence of any stakeholder involvement, the assessment methodology especially significance matrix is a concern.

5.11 Soils, Land and Geology

5.11.1 Compliance with Legislation and Best Practice

The EIA Directive and Guidance on the preparation of the EIA Report together with European Commission (1999) 'Guidance for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions' (Ref 50) set out broad targets which must be met rather than specifying how these targets (such as assessment of slope stability) should be met. The Directive and guidance therefore implicitly require that an EIA makes use of the best available guidance and best collective specialist understanding for any given topic. In the case of an EIA involving peat soils, particularly in the assessment of slope stability and associated impacts, little subject-specific guidance is provided by the Irish Authorities. A significant body of relevant scientific literature nevertheless exists, some of it dating back to the 1980s, with which to inform decision-making. This body of literature has recently been supplemented by specific guidance developed by the Scottish Government for use when undertaking an assessment of peat slide risk for windfarm development.

This Scottish Government guidance (SGG-2017) (Ref 51) is widely acknowledged as the best subject-specific guidance currently available, although the guidance itself highlights certain areas of continued uncertainty and the user of the guidance is referred to relevant scientific publications in order to give due consideration to these uncertainties.

The rEIAS states repeatedly that Chapter 10 Geology, Soils and Land uses SGG-2017 as the basis for its decision-making. Almost all the relevant field data used in the rEIAS were, however, obtained long before the SGG-2017 was published, so it cannot be the case that the process of gathering site data was shaped by SGG-2017. Furthermore, although the rEIAS risk assessment based on these old data was carried out in 2020 and claims to conform to SGG-2017 guidance, for several critical issues this is not the case, nor does the rEIAS take account of the significant body of available relevant specialist literature.

Although the survey data associated with the grid connection are more recent, they are limited and constrained in a number of ways which are entirely of the developer's own choosing, but as a result

the assessment of the grid connection cannot be said to be in compliance with the legislation, with acknowledged best practice, nor indeed with the guidance which the rEIAS claims to be following.

Section 2 of Appendix C provides an extended review of the SGG-2017 guidance, the body of relevant literature, and the approach adopted by the rEIAS.

5.11.2 Baseline Information

The first set of baseline information, submitted with the two EIS documents accompanying the original three planning applications, has already been ruled as inadequate by the ECJ ruling of C-215/06, EU:C:2008:380. Between 2003 and 2005, once construction had begun and following the peatslide event of 2003, a large body of post-hoc information was collected from the site. This information has been used to reconstruct the baseline condition of the site (usually referred to in the rEIAS as 'baseline conditions in 1998'). Of course this cannot be an accurate picture of the prevailing baseline conditions in 1998. By the time the 2003-2005 surveys were being undertaken a significant proportion of the windfarm roads had been constructed, drainage had been improved or installed, and blocks of forestry has started to be removed. The pre-construction survey of 2001 talks of the difficulties encountered while attempting to survey the pre-development site because: "The surface was waterlogged and very difficult to traverse." No such comments appear in the 2003-5 surveys.

Notwithstanding the belated nature of such survey effort, the methods used to obtain a picture of 'baseline' condition are valuable to an extent but limited in a number of important areas. In some cases, these limitations reflect the fact that survey pre-dates the SGG-2017 guidance by some 15 years, but in others there was already information available which, if used, would have shaped the nature of the survey methods employed. Unfortunately, such information was not used and so the information gathered misses key elements of what should have underpinned the baseline survey.

More significantly, during these intervening years the developer had the opportunity to undertake further survey informed by the SGG-2017 guidance and its earlier 2008 pre-cursor (given that the rEIAS already employs post-development survey data to develop a picture of the 'baseline'). No such survey has been undertaken, so the 2020 rEIAS is inevitably constrained by the survey methods employed immediately after the 2003 peatslide. The limitations resulting from the decision not to undertake further site-wide survey are explored in Appendix C , but a key issue is the fact that Lindsay & Bragg (2005) identified in their assessment of the 2003 peatslide that the area of forested peatland was riven with cracks which had formed along the forestry plough lines, and that these cracks had clearly played a major role in expanding the scale of the peatslide. The first edition of Lindsay & Bragg appeared in 2004, but even if the 2nd edition in 2005 is taken as the source of such information and thus did not feature in the instructions to the surveyors in 2003-2005, the developers have known about these cracks for more than 15 years and have had ample time to explore the implications for slope stability during this time. No such exploration has ever taken place. The cracks are not mentioned in the rEIAS 2020 peatslide risk assessment and do not feature in any form of geomorphological map (of the type required by SGG-2017, which specifically mentions the need to map cracks and fissures) nor in the map of drainage features presented as 'Figure 10-16' of the rEIAS.

That said, such cracking should have formed part of the survey requirements of the work undertaken between 2003 and 2005 because, as Lindsay & Bragg (2005) highlight, information about the scale of cracking beneath plantations on peat soils has been in the public domain since 1987 in publications such as Pyatt (1987) and Anderson (2001) (Ref 52). Slope stability is influenced to a considerable degree by cohesion of the peat, and cracks in peat represent areas of zero cohesion. The baseline condition of the site should therefore have recognised that linear features associated with zones often possessing zero cohesion dominated substantial parts of the site (given that most of it was afforested prior to windfarm construction). No such recognition has ever featured in any risk assessment, and plays no part in the 2020 risk assessment presented in the rEIAS. The further implications of this failure are explored in Section 6.1.4, of Appendix C.

Regarding the route of the Grid Connection, the range of field data gathered in 2018/2019 is even more limited than that obtained for the site as a whole in 2004/2005, despite claiming to follow the SGG-2017 guidance. As such, the baseline information obtained for the grid connection is

demonstrably inadequate both in terms of what type of data were gathered and over what area these data were obtained (see Section 5.3.2 of Appendix C).

5.11.3 Appropriateness of Assessment Methodology and Significance Criteria

An underpinning assumption of the EIA Directive and the associated guidance is that field survey will be undertaken and that a risk assessment will then be undertaken in a timely manner based on those field data in order to ensure that the data remain relevant to the risk assessment. In this case, the 2020 rEIAS risk assessment is being undertaken using site-condition data which were collected as much as 20 years ago, with even the most recent data for the site as a whole describing site conditions as they existed 15 years ago. The rEIAS itself states on numerous occasions that conditions have changed as a result of site management in the intervening years, thereby calling the utility of these old field data into question. Furthermore, although the rEIAS risk assessment asserts that site management activities have brought about improvements to stability in these intervening years, no more recent site-wide data are presented to support this assertion. The blindness of the assessment process to extensive cracking within the forested peatlands has been highlighted above, but the assessment also appears to be blind to the body of literature (including that referred to in SGG-2017) pointing to the role of such shrinkage cracks in the de-stabilisation of peat soils on slopes.

Indeed, the problem of failure to take heed of available specialist literature and guidance has implications for the risk assessment as a whole. The progressive improvement in site stability in the periods 1998–2003, 2004-2020, and 2020-2040 as presented in the sequence 'Figure 10-34, Figure 10-35 and Figure 10-36' of the rEIAS is based almost entirely on the single mitigating measure of peatland drainage. It is consistently assumed that drainage will stabilise the peat. While drainage will certainly increase the cohesion of the peat matrix, drainage also causes loss of water and consequent shrinkage of the peat (given that undrained peat consists of around 90% water by volume). Shrinkage within a volume of peat rarely occurs only in a vertically downward direction, although this will tend to be the dominant trend in peat under load, as is the case for peat beneath a 'floating' road. Peat not under load will tend to shrink in 3 dimensions, leading to cracks, fissures, deformation and creation of macropores (voids) which often occur in the shape of 'peat pipes'. As a result, while individual intact blocks of peat adjacent to infrastructure drainage, or in areas of existing or felled forestry, may display increased shear strength, the blocks themselves increasingly lose cohesion between each other because of cracking and deformation as shrinkage progresses. Peatland drainage consolidates but also dislocates. Loss of water can also make the blocks lighter and more buoyant, thereby making them more susceptible to uplift by an increase in hydrostatic pressure within sub-surface deformations such as peat pipes.

The result of maintaining 'a robust drainage system' across the site until 2040 is thus to establish a trend consisting of at least two opposing forces, only one of which is recognised within the rEIAS. While intact blocks of peat may indeed show increased cohesion, the peat body as a whole will shrink, distort and crack, reducing overall cohesion. The existing body of specialist literature and guidance points to the dangers associated with such a distorted and fractured peat system (see Appendix C), highlighting in particular the role of longer dry spells followed by intense convective storms - a weather pattern projected to become more frequent with climate change.

In terms of specific risk-assessment steps recommended by SGG-2017, the rEIAS does not explain the steps involved in arriving at the risk assessments set out in 'Figure 10-34, Figure 10-35 and Figure 10-36'. Details of the assessment are instead to be found in 'Sections 1, 2.5, 3.4 and 5.6, together with Tables 2-2, 3-5, 5-4 of Appendix B and Tables B1 to B5 of Appendix of Appendix B'. The critical factors in the initial baseline risk assessment are to be found in the last of these ('Tables B1 to B5 of Appendix of Appendix B') where site factors are categorised and thus assigned a score for the assessment process. No clear explanation is provided for the categorisation process and at least some decisions can be readily challenged (see Appendix C).

Notwithstanding the questions associated with the risk assessment for baseline conditions, the assessment does identify a substantial number of areas within the site which emerge from the assessment process as having an unacceptable degree of peatslide risk. The number so highlighted is smaller than might be achieved by an assessment which follows more closely the SGG-2017

guidance, but all forms of assessment highlight the risk posed by the northern sector of the site in particular, but also much of the western and south-western sector of the site (the slopes in this last sector, incidentally, inclined towards the village of Derrybrien).

The risk assessment then offers 'Tables 3-5, 5-4 of Appendix B' as the basis for subsequent conversion of those areas identified as having an 'unacceptable risk' to those ultimately having negligible risk by 2020. No explanation is given for the change in 'Hazard Likelihood' score in these tables. It seems that for the period 1998 to 2006, the values used for 1998 are simply and universally reduced by 2, then between 2006 and 2020 all values are universally reduced to a 'Hazard Likelihood' value of 1. No site data, no explanation and no justification are provided for this change in values, other than to state that site-wide drainage mitigation measures reduce risk.

Other concerns about the risk assessment process are explored in Section 6 of Appendix C.

5.11.4 Response to Stakeholder Concerns

There is no evidence within rEIAS Chapter 10 of any response to stakeholder concerns.

Recently the developer has placed a Hazard sign at the entrance to the turbary stating that there is a risk of instability if peat cutting activities are undertaken. This prevents the local residents from obtaining a fuel supply for use next winter but has also heightened concerns about site stability, despite continued assurances from the developer (and repeated in the rEIAS) that mitigation measures have rendered the site safe.

The likely basis of concern and the reason for the Hazard sign almost certainly originate from a series of factors which could have been anticipated by the developer had they undertaken adequate survey and had they taken account of the issues highlighted by Lindsay & Bragg (2005) on behalf of local stakeholders concerns which have been raised many times with the developers. The issues involved are explored in more detail in Appendix C.

5.11.5 Effect of Decommissioning

Decommissioning will involve removal of the turbines, associated buildings, and cabling, but will leave the roads, turbine bases and drainage in place. The rEIAS states that the drains will steadily choke up and cause ponding, providing conditions for re-development of a peat-forming vegetation.

The danger to site stability of ponded water and failing drainage runs as a constant theme through all reports contained within the rEIAS Appendices, from the initial post-slide AGEC (2004) (Ref 53) report to the 2020 reports by AGL and Fehily Timoney, as well as in the rEIAS itself. On decommissioning, however, it seems that the rEIAS considers it now acceptable to permit water to pond and the drainage to fail. It acknowledges that this will "reduce the effect on the stability of the peat to slightly significant" [p.10-337]. After almost 40 years of striving to prevent ponding and collapse of the drainage system it is difficult to see how the rEIAS comes to the conclusion that allowing precisely this to occur will amount to a 'slightly significant' effect. No explanation is provided.

As well as being founded on the false premise that all drains will inevitably infill with time, there is also no acknowledgement that excavated roads will continue to act as breaks in the peat mantle and therefore represent areas of weakness, while roads 'floated' over the peat will continue to subside into the peat. This is because 'floating' roads have generally been employed where the peat is particularly deep, and deep peat has considerable scope for long-term subsidence under such conditions. The breaks in the peat mantle and breaks in slope created by these roadways will continue to have an effect and represent lines of weakness long after the windfarm has been commissioned in 2040 but there is no acknowledgement of this in the rEIAS.

5.11.6 Effectiveness of Proposed Mitigation Measures

Mitigation measures comprise two types of action: firstly, monthly site walkovers by site staff looking for signs of instability, supplemented by an annual walkover by a qualified geoengineer; and secondly, continued drainage throughout the life of the windfarm but not beyond.

No other mitigation measures are offered by the rEIAS. There is currently no automated instrumental monitoring anywhere on the site and there are no plans to install any such instrumentation. A small

set of automated instrumentation was installed in 2006 but it was decommissioned in 2014 because it was no longer working, and it was not replaced. The only 'quantitative' monitoring devices now are seven 'sighting poles' placed in the area of the 2003 peatslide, designed to detect by eye whether there is any sign of peat movement. The remainder of the site has no monitoring devices. Consequently, there is no means of judging the effectiveness of the two systems of mitigation *measures currently employed.*

5.11.7 Recommendations for Further Mitigation Measures

There is a fundamental conflict between what the windfarm requires – effective drainage along roadways to maintain their trafficability and around turbine bases to minimise buoyancy effects – and what the best measures are to ensure stability of the peat mantle, which is best achieved by establishing a vigorous peat-forming vegetation across the site, thereby providing a strong fibrous surface layer.

As a minimum, however, tests should be started now to determine the best approach, or approaches, for stabilising the site into the long term once the windfarm is decommissioned. As an example of what might be tested, Peatland Action in Shetland has had some success in using old salmon-farm netting to stabilise eroding peat slopes and establishing new growth of peat-forming Sphagnum swards. Given the likely fractured nature of the peat across the forestry areas, tests might be undertaken to explore the potential of combining netting of the type used by peatland Action Shetland, or jute netting used by Moors for the Future in northern England, with the use of 'soil nails', which are commonly used by engineers in unstable soils.

Indeed, a great many methods have been tried and documented in the UK and Ireland for the restoration of drained, formerly-forested or eroded blanket bog. The recently-updated 'Conserving Bogs - The Management Handbook' (Ref 55) provides a great deal of valuable information (and see Section 7 of Appendix C). The important issue is that such testing and mitigation should be undertaken, and successful methods applied site-wide, *prior* to the end of the decommissioning phase in 2040.

5.11.8 Additional Information or Evidence Required

It is a point of some urgency that a re-survey of the whole site be undertaken, with particular reference to the areas of forested and formerly forested ground to determine the extent of fissuring and potential peat piping within these areas. Particular attention should also be devoted to a comprehensive survey of conditions in the northern and western sectors of the site, given the repeated identification of these areas as being at risk in the 'baseline' condition.

These investigations should follow the guidance provided in SGG-2017. Survey should therefore incorporate peat depths, slope angles, coring using a Russian corer to obtain realistic von Post values and Troels Smith categorisation, mapping of any evidence of surface or sub-surface seepage, identification and mapping where possible of peat piping, and mapping of all forestry drains, ploughing furrows and cracks within those furrows.

Shear vane testing should be undertaken using a shear vane diameter of at least 200 mm, but interpretation of shear vane readings should be used as indicative only and assumed to be over-estimates of peat shear strength.

A re-assessment of peat slide risk should then be undertaken using these new data, and be based on the assessment process set out in SGG-2017.

5.11.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The conclusions set out in the rEIAS cannot be described as reasonable because these conclusions are based on a process that fails in several critical ways to follow its own chosen best-practice guidance:

- The data on which the assessment is based are, by the admission of the rEIAS itself, mostly at least 15 years out of date;

- The processes by which these (and even more recent data) were obtained fail to follow the procedures set out in the chosen best-practice guidance;
- Key aspects of the ground conditions are not measured, mapped or assessed at all;
- The risk assessment sequence fails to take into account the many caveats presented in the chosen best-practice guidance;
- The risk assessment process also fails to explain the claimed and predicted sequence of change to risk and hazard over the life of the windfarm and presents no data to support this predicted change;
- No systematic, instrumented monitoring system has ever been put in place across the site and there are no plans to do so. The only instrumentation installed was highly localised and was decommissioned (without replacement) in 2014;
- Best-practice guidance used by the rEIAS requires that measures be put in place to control the effects of any slope failure, while one of the earliest reports commissioned by the developers following the 2003 peatslide recommended that a Contingency Plan be drawn up to minimise any future slope failure or other similar event – but the rEIAS does not present any such Contingency Plan or any measures taken to control the effects of a future slope failure;
- The conditions acknowledged as likely to prevail after decommissioning represent those conditions repeatedly described by the rEIAS as being a hazard to stability, yet the rEIAS concludes that development of such conditions after decommissioning will be only 'slightly significant'.

In addition to the actions listed in 5.12.8 above, further remedial works should comprise:

- Production of a Contingency Plan for all possible routes for material arising from future slope failure;
- Installation of appropriate, environmentally sensitive control measures on all possible routes for material arising from future slope failure;
- Where updated risk assessment (based on survey and monitoring set out in 5.12.8 above) indicates moderate to high risk of slope failure, particularly in northern and western sectors of the site, those sections of the development should be abandoned, as was done for the area around Turbine 16, with specific remedial measures applied to those areas in order to reduce future loss of stability (i.e. removal of turbines and development of restoration approaches designed to enhance and ensure long-term stability of these areas).

5.12 Hydrology and Hydrogeology

5.12.1 Compliance with Legislation and Best Practice

Chapter 11 of the rEIAR provides a list of the legislation and best practice relevant to hydrology and the water environment. It is noted that aspects linked to water quality are covered in Chapter 8: Biodiversity – Aquatic Ecology. This list is comprehensive, however the assessment would benefit from a table summarising how the project achieves compliance with the key requirements of these laws and policies.

The relationship between peat soils, hydrology and stability is, however, identified in the rEIAR as being guided by Scottish Government (2017) 'Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects' referred to as 'SGG-2017 in Section 5.12 above. This guidance, widely accepted as the best currently available, sets out a range of factors that should form part of any risk assessment.

Both SGG-2017 and the rEIAR emphasise the key role played by water and hydrological management in the assessment of potential slope-failure hazard. SGG-2017 highlights the need to identify all features which represent disruptions to the hydrological integrity of the peat body. As well as drains, roads and infrastructure, SGG-2017 identifies as features to map and investigate all fissures, peat

pipes and other forms of distortion resulting from shrinkage of the peat as a result of drainage impacts. SGG-2017 acknowledges the difficulty of doing so when a site has been afforested but emphasises that such mapping must be undertaken despite the difficulties. Only by creating a map of all factors influencing the hydrology of the peat body can a true estimate of risk and hazard be obtained.

The rEIAR largely ignores the forested and formerly-forested blocks within the site in terms of hydrological mapping. Indeed, at a more general level, the rEIAR does not consider the issue of peat shrinkage due to drainage at all. As such, the rEIAR cannot be said to have followed the guidance (and associated specialist literature) which the rEIAR itself claims to be following.

5.12.2 Baseline Information

Baseline information has been collected through desk study and a range of field surveys. The baseline circa 1998 is described and key changes to this baseline along the projects timeline to the time of assessment in 2020 have also been described. With the exception of peat soil hydrology (addressed below), the sources of desk study data referenced are considered generally appropriate and the field surveys undertaken are in line with expectations for defining the surface water environment. The description of the baseline is supported by suitable graphics and the descriptions cover physical landform and land use/cover, climate, hydrology, and groundwater, noting that surface water quality is described in detail in Chapter 8.

In terms of peat-soil hydrology and the impact of drainage-induced shrinkage (mainly driven by the forest plantations) Lindsay & Bragg (2005) specifically highlight and illustrate the extensive presence of linear cracking beneath the forested areas across the windfarm site, while Appendix C explores in considerable detail the significance of such features for any risk assessment. Not only do such fissures and sub-surface pipes represent sources of potential instability, they are also potentially major contributors to the overall hydrological pattern of water movement through, and from, a site thus affected. Such cracks, fissures and piping are commonly associated with the forestry ploughing furrows, which themselves represent a major influencer on surface water flow – indeed this is one of the key purposes of such ploughing furrows. Consequently, the influence of forestry on both the surface and sub-surface hydrology of a blanket bog landscape can be profound.

There is no mapping of ploughing furrows, no mapping of peat cracks associated with such furrows, and very little attempt to map possible sub-surface piping associated with the forested ground – which represents a large proportion of the site. Given that the whole site, apart from the area of turbary, was afforested prior to windfarm development, failure to map diligently the hydrological effects and legacy of the forestry represents a major gap in the required set of baseline information.

5.12.3 Appropriateness of Assessment Methodology and Significance Criteria

The assessment methodology is suitably described and the significance criteria and adopted approach are consistent with what is documented in Chapter 1.

The assessment would benefit from a table to summarise key receptors and their attributes, the value assigned to each and the rationale behind the values assigned.

The assessment is also supported by a stand-alone Flood Risk Assessment.

5.12.4 Response to Stakeholder Concerns

The Chapter does not provide any details with regard to stakeholder engagement and no reporting of any concerns raised by stakeholders is included.

The South Galway Flood Relief Committee submitted a complaint to the EC detailing how they attempted to contribute to the rEIAR but were ignored by the developer. The only communication they received in response to the letter sent to the developer in April 2017 was in a notice on 2 September stating that a rEIAR has been submitted to An Bord Pleanala.

Key points raised by the complainant include the concerns that flood peaks and the frequency of flooding events are increasing and impacting on residential areas downstream in the catchment. The removal of the forestry is cited as a causative factor, based on established research evidence. This evidence is cited by the stakeholders in the form of research results obtained by the UK Centre for

Ecology & Hydrology, which demonstrate a quantitative relationship between increased water flows from areas as forestry plantations are felled. Such effects could be mitigated by re-establishing a Sphagnum-rich peat-forming community across the felled areas because such a community provides 'surface roughness' that slows peak water flows in two ways. Firstly, the semi-porous nature of a Sphagnum-rich carpet acts to slow lateral water movement, and secondly, the natural growth form of different Sphagnum species into 'hummock-hollow' structures creates physical undulations in the Sphagnum carpet which further impede water movement as it moves across the land surface (Ref 56). However, development of a Sphagnum-rich community with its permanently high water-table poses challenges for the developer seeking to keep the site as well-drained as possible in order to minimise peat slide risk and turbine instability.

The prime purpose of drains is to remove surface water as rapidly as possible from an area. It is inevitable, therefore, that a robustly drained hill with a mantle of blanket peat will shed water much more rapidly than a similar hill covered by a mantle of healthy blanket bog vegetation rich in Sphagnum. While establishment of the conifer plantations largely destroyed the natural bog vegetation, the trees themselves will have taken up much of the precipitation inputs to the hill summit. Once these plantations are removed there is neither the tree cover nor the original functioning bog surface to slow water flow from the hill. It is consequently inevitable that flood peak flows will increase now that the plantations have been removed, no peatland restoration has been undertaken, and the drainage system is maintained in a free-flowing condition. This combination of factors is well described in the scientific literature and has been for some years. The consequences should have formed a clear part of the rEIAR in response to stakeholder concerns, as should a set of mitigating measures to address these issues - the best of which would have been to begin trials for the restoration of an actively peat-forming vegetation in a safe and stable manner, exploring methods used by experienced restoration teams such as those highlighted in Appendix C. The onus would lie with the developer to demonstrate to stakeholders how these two conflicting demands could be met – on the one hand, stability and trafficability for roads and turbines, versus, on the other hand, potential re-development of a functioning Sphagnum-rich vegetation providing nature-based solutions to intense rainfall events and flood peaks, or some equally effective mitigation measure.

The complainant also raises issues with the data used to describe historical flooding within the Flood Risk Assessment. The report cites floodinfo.ie as a data source and describes the closest downstream areas affected by significant flooding as more than 20km downstream of the windfarm. The compliant highlights the inaccuracy of this, with settlements located 10km and 12km downstream suffering from extensive flooding.

A robust consultation with key stakeholders would be expected to form part of an ES chapter, together with details of how any concerns raised have been addressed, thereby giving confidence in the robustness of the assessment and the proposed mitigation methods.

5.12.5 Effect of Decommissioning

The Chapter includes an assessment of the effects of decommissioning the wind farm. The assessment records which elements of the windfarm infrastructure would be removed, and which would be left in-situ. A key element for consideration is the land drainage system installed to prevent ponding on site during operation of the windfarm, with the proposal to leave this system in place with no future maintenance. The assessment acknowledges that over time, drainage channels would be expected to reduce in capacity due to vegetation growth and silting and effects on the hydrological regime and are stated as the temporary, localised and minor negative. .

As described in Section 5.11, the justification for the assessment of only minor and localised effects is not considered to reflect the potential implications on the peat-hydrology and land stability regimes, and it is considered that the magnitude of effects may be understated.

5.12.6 Effectiveness of Proposed Mitigation Measures

The report contains detailed information about the measures put in place to reduce the effects of the development during its construction. Measures to mitigate impacts during construction are in line with best practice and are typical for a wind farm project.

It also describes the measures included in the design to mitigate the effects of operation and decommissioning of the wind farm.

The regime of site inspections and maintenance during operation is described, along a timeline the types and frequency of activities that are undertaken, for example, clearing of blocked land drains, measures to manage scour/erosion and repairs to the floating access road network. The additional mitigation measures put in place following the peat slide, for example, provision of silt traps, barrages to prevent further downslope movement of materials and provision of alternative and additional surface water drainage routes, are also described.

The assessment concludes the mitigation measures to have been robust in preventing changes to the hydrological regime and to water quality during construction and operation, noting that the drainage network has to date demonstrated sufficient capacity to convey site runoff during a range of storm events, without causing excessive flooding onsite nor downstream

There is apparent conflict between the mitigation approaches applied during operation, when a drainage system is actively maintained to move rainfall runoff off site and prevent surface water ponding, and during decommissioning, when this drainage system would be allowed to degrade, without any ongoing maintenance. The limitations of the effectiveness of these proposed mitigation strategies on the peat hydrology and slope stability regimes of the site are described in Section 5.11.

5.12.7 Recommendations for Further Mitigation Measures

Recommendations for further mitigation are made in Section 5.11, which would also reduce long term effects on peat-hydrology and the land drainage regime.

The 2003 peat slide illustrated the potential scale of hydrological impact resulting from a single large event such as this. The inadequacy of the peat slide risk assessment discussed in Section 5.12 above and Appendix C raises significant questions and concerns about the treatment of such a possibility within the rEIAR. As far back as 2004, AGEC ('rEIAR, Appendix A') recommended that contingency plans be draw up for all areas potentially affected by a similar event, and it is a requirement of SGG-17 that 'Engineering mitigation measures to control landslide impacts' be put in place, but there is little evidence of either a Contingency Plan or physical measures to control potential impacts – other than down the existing 2003 slide zone. This is despite the rEIAR itself identifying a substantial number of other areas across the site having significant potential risk in the absence of mitigating measures. Given that the proposed mitigating measures have the potential to increase risk over time, a Contingency Plan and physical measures to limit impact would appear to merit priority action.

5.12.8 Additional Information or Evidence Required

A record of stakeholder engagement should be provided and responses to the issues raised by the South Galway Flood Relief Committee should be provided.

5.12.9 Reasonableness of Conclusions and Need for Possible Remedial Works

Table 11-12 provides a clear and concise summary of the assessment. Other than the *recommendation to continue the current operational inspection and maintenance regimes, no remedial* works are identified to be necessary.

Considering the issues raised by the South Galway Flood Relief Committee, and the concerns reported in Section 5.11 with regard to the conclusions of the assessments linked to the peat hydrology of the site, without further evidence, some conclusions of the hydrology and hydrogeology assessment cannot be considered reasonable. In particular, there is need for further justification of the assessed local and minor effects of windfarm decommissioning on the catchments hydrological regime.

5.13 Air and Climate

5.13.1 Compliance with Legislation and Best Practice

Chapter 12 provides a list of the legislation and other statutory policies and guidance relevant to Air Quality. The list of legislation is comprehensive, although it should be noted that not all the referenced legislation and pollutants are relevant to this assessment.

The assessment would therefore have benefitted from focusing on the parts of the legislation and pollutants that are relevant to this assessment.

The air quality assessment has been undertaken in accordance with the Institute of air quality management (IAQM) guidance which is an appropriate document to follow for the construction and operational impact on local air quality for this assessment.

In terms of carbon emissions from the blanket peat soil, which is the predominant soil type across both the wind farm and the grid connector, the rEIAS uses the Scottish Government Carbon Calculator (Ref 57). This is widely accepted as the best available tool for assessing carbon emissions form windfarm developments on peat, although there are acknowledged weaknesses in the model.

5.13.2 Baseline Information

The baseline information is provided in the assessment and demonstrates that air quality is good in the area of the proposed development.

The Scottish Government Carbon Calculator consists of several interlocking modules which together arrive at a final integrated calculation of net carbon balance. These modules consist of, for example, construction emissions, transport emissions, reductions in fossil fuel emissions, and a number of other carbon-related factors. Several of these modules are associated with significant uncertainties and some of these uncertainties, or the figures fed into them, can have a substantial impact on the final outcome.

The baseline data used to populate the Carbon Calculator are not presented. Instead, summarised results for various modules are presented in '*rEIAS, Section 12.4.6.1, 6.4.6.2 and Appendix 12.1 and Appendix 12.2*' but it is impossible to judge the merit of these because the individual data inputs used (such as average depth of water table, or volume of concrete used) are not listed. Rather than present the summary output tables in '*Appendix 12.1 and 12.2*', a table of all data inputs should have been presented. Without this, no meaningful assessment can be made of the baseline information used to generate the carbon payback periods given in '*rEIAS, Table 12-14*'.

5.13.3 Appropriateness of Assessment Methodology and Significance Criteria

The air quality assessment has been undertaken in accordance with the Institute of air quality management guidance which is an appropriate document to follow for the construction and operational impact on local air quality for this assessment. Based on the evidence presented in the report and distance to nearby receptors the conclusion of negligible and no significant impact in relation to construction is in accordance with the guidance.

During operation the report states that the project would not give rise to significant emissions to atmosphere and therefore the impacts are not significant, this would be expected given the nature of the development.

While the input data necessary to make a judgement about the proposed carbon payback period are not presented, it is necessary to highlight the fact that '*rEIAS, Table 12-14*' offers only the 'Expected' payback time from the Carbon Calculator, whereas 'Appendix 12.1' shows that uncertainties within the Calculator and input values can double payback times to an estimated maximum of 14 years if the carbon from the 2003 peat slide event is included. Were another peat slide of the same or larger magnitude to occur, this could have a major impact on the total carbon payback, but neither the current acknowledged potential maximum payback period, nor the potential implications of further peat slide events, are considered.

5.13.4 Response to Stakeholder Concerns

No specific concerns on local air quality.

The local community has questioned the Carbon Calculator payback times presented by the developer, but the details of how these figures have been arrived at are not presented in the rEIAS.

5.13.5 Effect of Decommissioning

The effect of decommissioning has been included in the assessment and based on the guidance that has been followed and the nature of the conclusions of the assessment are in line with the IAQM guidance.

Decommissioning carbon costs are included within the Carbon Calculator.

5.13.6 Effectiveness of Proposed Mitigation Measures

Mitigation has been proposed for decommissioning this includes dampening of stockpiles, given the distances to nearby receptors the mitigation is appropriate.

No specific mitigation measures aimed at reducing carbon emissions from the peat are offered.

5.13.7 Recommendations for Further Mitigation Measures

The Carbon Calculator provides for carbon gains made by restoring a windfarm site to a condition whereby it returns to active peat formation. The rEIAS at present makes no commitment towards restoring blanker bog habitat (with its natural capacity for carbon-capture) following decommissioning. Currently, the rEIAS simply states that bog vegetation may naturally re-develop over time following decommissioning because drains will steadily choke with natural vegetation. Appendix C explains why this may not happen for some drains, and also highlights the potential for long-term instability without active intervention to create a stable peat-forming vegetation before the developer leaves the site. Recommendations are made under 'Geology, Soils and Land' above and in Appendix C for actions that the developer might take to bring this about, not least as a means of providing better prospects for ensuring long-term slope stability across the site.

5.13.8 *Additional Information or Evidence Required*

All input data used in populating the various modules of the Carbon Calculator are required.

5.13.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The conclusions are reasonable based on the information in the report and the type of project, no remedial works are recommended for local air quality.

The proffered conclusions with respect to carbon balance depend entirely on the data used to calculate this balance. Without seeing the input data it is not possible to judge how reasonable the conclusions as presented might be.

5.14 Material Assets

5.14.1 Compliance with Legislation and Best Practice

Article 3 of the EIA Directive provides that the environmental impact assessment shall identify and describe and assess in an appropriate manner the direct and indirect significant effects of a project on 'material assets, cultural heritage and the landscape'.

The term 'material assets' has a broad scope, which may include assets of human or natural origin, valued for socio-economic or heritage reasons.

The draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017) published by the Environmental Protection Agency recognises that the meaning of this factor is less clear than others and goes on to state that Material Assets can now be taken to mean built services and infrastructure (built service, roads and traffic and waste management). Material assets are in practice usually considered across a range of topic areas within an ES, in particular historic environment and socio-economics. This is the approach taken by the rEIAR.

Chapter 13 of the rEIAR references the EPA Advice Notes for Preparing Environmental Impact Statements (Draft 2015) and the EPA Draft Guidelines on the Information to be Contained in EAIRs (2017). No other reference is made to policies or legislation.

Socio-economic, community and recreation effects are assessed within Chapter 4 Population and Human Health, while effects relating to historic environment are assessed within Chapter 15. Traffic and transport assets are considered in Chapter 14 of the rEIAR. Land use has been assessed in more detail in Chapter 10 Land Soils and Geology in addition to Chapter 13. Other Chapters relevant to the assessment are also noted.

Chapter 13 Material Assets sets out the impact of the development with respect to Material Assets not covered in the Chapters identified above. Chapter 13 of the rEIAR identifies the relevant built services and natural resources identified for the purpose of material assets assessment as:

- Water supply
- Sewerage Schemes and Wastewater Infrastructure
- Energy Infrastructure
- Telecommunications
- Tourism & Recreational Infrastructure
- Land use

Chapter 13 sets out the justification for material assets not considered in detail in the Chapter as they are not considered to be associated with any potential significant effects as a result of the Project. This includes airports and navigation, cities, towns, villages and settlements, agronomy and commercial and industrial development. It is not clear whether any consultation has been undertaken as part of this scoping out process.

5.14.2 Baseline Information

A site visit was undertaken on 5 November 2019 by the author of Chapter 13. Although not specifically referenced as such, a desk top study was also undertaken. The baseline represents the position prior to the commencement of development. Reference is made to other Chapters of the rEIAR where relevant. No study area is defined for collection of baseline data, although reference is made to distances to some of the assets identified (e.g. telecommunication masts and key amenity features). The baseline information refers back to historical sources (e.g. Ordnance Survey historic aerial views) where appropriate and also references changes to the baseline which have occurred during construction (e.g. telecommunications mast installed on site in 2005). Data sources are referenced for some assets (e.g. tourism assets) but it is not clear where information has been obtained from for all assets discussed or whether any consultation has been undertaken with stakeholders.

Although there are omissions in terms of defining the study area and sources of data, the baseline information is appropriate, taking into consideration the extent of cross-referencing in the Chapter.

5.14.3 Appropriateness of Assessment Methodology and Significance Criteria

Chapter 13 makes reference to Table 3.3 Description of Effects in the EPA Draft Guidelines on the Information to be Contained in EIARs (2017) and the terminology used, although the classification of significance varies from Figure 3.5 of the Draft Guidance. The Chapter states that for the purpose of the assessment 'significant effect' is an effect that either supports or undermines the integrity of the material assets (both man-made and natural) but it isn't clear which significance levels this applies to (for example if this would only apply for profound, major and moderate effects). The assessment terminology is largely consistent with Table 3.3 Description of Effects in the EPA Draft Guidelines on the Information to be Contained in EAIRs (2017) but as the table is not provided in the rEIAR this is difficult to follow. The significance criteria set out in Table 13-1 of the rEIAR do not however appear to have been applied in the assessment.

The Chapter does not provide information to inform the description of effects where this would have been expected. For example, during construction the Chapter states that large areas of forest plantation have been felled to accommodate the wind farm and grid connection. No information is provided in terms of the size of the area felled (although the area is given in the mitigation section of the Chapter).

It should also be noted that the areas cited in the report are inconsistent. The Ecology Chapter states that "preconstruction the 344.5 ha wind farm site had 265 ha of conifer plantation of which 222 ha was felled to facilitate construction of the wind farm".

Felling is also described as a neutral effect, which according to Table 3.3 Description of Effects in the EPA Draft Guidelines on the Information to be Contained in EIARs (2017) implies that there are no effects or effects are not imperceptible, which is questionable given the scale of the change in land use. Similarly, the temporary road closures during the peat slide are reported as imperceptible, whereas a non-significant impact or perhaps slight effects would seem more appropriate, although it is noted the Chapter refers to Chapter 14 of the rEIAR regarding effects to the road network.

5.14.4 Response to Stakeholder Concerns

The rEIAR makes no reference to concerns from stakeholders.

5.14.5 Effect of Decommissioning

The Chapter notes that potential impacts on material assets as a result of decommissioning activities are likely to be similar to those experienced during the construction of the project, which is a reasonable assumption.

The Chapter notes that based on the age profile much of the forestry estate surrounding the wind farm may be subject to felling in the coming decade but that these activities are not expected to coincide with the anticipated project decommissioning date of circa. 2040 and therefore no significant cumulative impacts are anticipated in that regard. No information is provided regarding the source of information or whether consultations have been undertaken with Coillte regarding forestry felling plans to substantiate this.

5.14.6 Effectiveness of Proposed Mitigation Measures

The mitigation section of the Chapter states that the total area of the forestry felled was circa 150 ha, inclusive of roads, firebreaks, forest plantations and some open areas and that the replanting requirement was 119.3ha of forest plantation comprising a mixture of Sitka Spruce, Lodgepole pine and Broadleaves, which appears to have been proposed at locations remote from the wind farm. No information is included on how the area replanted was agreed with statutory bodies. No information is provided to confirm this mitigation was undertaken.

No remedial mitigation measures or monitoring is in relation to Material Assets are proposed.

5.14.7 Recommendations for Further Mitigation Measures

Although felling of the forestry surrounding the wind farm is not anticipated to be undertaken at the same time as decommissioning, consultation with Coillte should be undertaken and their felling plans reviewed.

During decommissioning the contractor could be required to be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in *advance with the relevant service provider.*

5.14.8 Additional Information or Evidence Required

There is no evidence provided to confirm the replacement planting proposed was undertaken. Information could be provided on the location of the planting sites, areas planted and whether the establishment was successful.

5.14.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The assessment methodology broadly follows the criteria set out in Table 3.3 Description of Effects in *the EPA Draft Guidelines, although it is unclear how Table 13-1 Classification of Significance set out* within the rEIAR has been applied. The conclusions however seem on the whole reasonable, although the conclusion that felling of forestry on the wind farm site prior to construction is a neutral effect is questionable.

Notwithstanding the above, it is considered unlikely that any remedial works for the existing operation of the wind farm would be required for material assets. Confirmation that replacement planting for forestry felled was undertaken should be sought. Consultation with Coillte regarding their felling plans in the future is also recommended.

5.15 Traffic and Transport

5.15.1 Compliance with Legislation and Best Practice

Chapter 14 discusses the impact of the development with respect to Traffic and Transport. It sets out the guidelines which have been followed in the preparation of the assessment, namely the Traffic and Transport Guidelines (2014) published by Transport Infrastructure Ireland, and the draft Guidelines on the Information to be Contained in EIARs.

Whilst the wider rEIAR has been prepared in accordance with the EIA Directive, it is not made clear which specific legislation the Traffic and Transport Chapter accords with.

It is not made clear how the study area or method of the Chapter have been derived. EC Guidance on Scoping (2017) notes that scoping is not mandatory under the EIA Directive, the guidance states that it is good practice to undertake scoping even if it is not required by legislation (Section 1.4). In the absence of scoping, it is not known whether the developer has fixed the study area and method with the agreement of the competent authority or its consultees, such as Galway County Council.

The Directive stipulates, at Annex II.A, that a description of the location of the project, with particular regard to the environmental sensitivity of geographical areas likely to be affected, must be provided. It is noted that Figure 14.1 does not illustrate the full extents of the study area, omitting key roads such as R458 and the M18.

The environmental sensitivity of geographical areas within the study area has not been defined. For example, populated areas such as Gort, which lies on the R380 between Derrybrien and the M18, have not been explicitly considered.

In accordance with Article 5(3) of the EIA Directive, the author of the Chapter, and their experience and qualifications, has been given.

The Chapter does not set out any transport policy against which the development should be assessed. The EC Guidance on the Preparation of the EIARs (2017) notes that the significance of effects should be clearly explained with reference to legal or policy requirements or other standards.

5.15.2 Baseline Information

The Chapter advises that, in the absence of baseline traffic data prior to construction of the wind farm, the assessment has been undertaken on a qualitative basis.

No baseline traffic flows are given for Black Road nor the R353 nor the R458 (in Gort), all of which are public roads with existing environments of varying sensitivity. For example, R458 passes through the town centre of Gort, and therefore would likely have medium or high sensitivity.

The EIA Directive states, at Annex IV, that the Environmental Impact Assessment Report should include:

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

The criteria included within the EIA Directive is therefore equivocal as to the necessity of describing baselines on a quantitative basis. However, a reasonable interpretation of the criteria in the context of transport planning would be that 'information' means traffic data, and traffic data is quantitative by its very nature. In addition, it would not constitute 'unreasonable effort' on the part of a developer to attempt to quantity traffic flows, even retrospectively. Based on this interpretation, the failure of the developer to set a baseline in quantitative terms does not meet the requirements of the EIA Directive.

This point is relevant for all stages of assessment with respect to significance of effects, as described below.

The EC Guidance on the Preparation of the EIAR elaborates on assessment method, at Section 1.4.2, stating that *significance determinations should not be the exclusive prerogative of 'experts' or 'specialists': significance should be defined in a way that reflects what is valued in the environment by regulators and by public and private stakeholders.* The assessment of a baseline in qualitative terms equates to a prerogative of experts. On the basis of this interpretation, the failure of the developer to set a baseline in quantitative terms does not comply with the EC Guidance.

With regards to traffic and transport, the value of the existing environment is a direct function of existing traffic flows. On this basis, the magnitude of impacts should be calculated from the relative change compared to the baseline.

This is of particular relevance for assessing the effects of decommissioning, for which existing traffic data could be used to form a future baseline. Whilst the EC Guidance on the Preparation of the Environmental Impact Assessment Report acknowledges that data can be difficult to find, it suggests that proxy indicators can be used to understand the environmental situation (Section 1.2.2). The Chapter neither presents traffic survey data nor proxy indicators and therefore does not comply with the EC Guidance.

5.15.3 Appropriateness of Assessment Methodology and Significance Criteria

The Chapter has been prepared with regard to Traffic and Transport Guidelines (2014) published by Transport Infrastructure Ireland (Ref 58), and the draft Guidelines on the Information to be Contained in EIARs (2017) published by the Environmental Protection Agency. It is noted that the Chapter should also have been prepared in accordance with the EC Guidance on the Preparation of the Environmental Impact Assessment Report.

Figure 3.5 of the draft Guidelines sets out that the significance of effects should be derived from the sensitivity and significance of the existing environment combined with the magnitude and duration of the impact. The Chapter defines a significant effect as one that "*supports or undermines the operation of the roads and transport environment and the traffic experienced in that environment*" (Section 14.1.3.1).

The EC Guidance on the Preparation of the EIAR states that (Section 1.4.2), when those preparing the EIA report have to determine the significance of effects, the assessment of significance should be based on clear and unambiguous criteria:

Significance criteria take both the characteristics of an impact and the values associated with the environmental issues affected into account.

Significance is always context-specific and tailored criteria should, thus, be developed for each Project and its settings.

The Guidance elaborates that it is important that the assessors set out a transparent methodology that explains how they approach the assessment and that they then demonstrably apply that methodology in their assessment.

The Chapter does not set out the method for establishing the existing environmental sensitivity of geographical areas within the study area, nor does it set out a transparent method for establishing the magnitude of impacts. In the absence of either, it is not possible to validate the assessment of the significance of effects.

The sensitivity of the existing environment should consider all who interact with the transport network, ranging, for example, from long-distance hauliers to pedestrians crossing a road. It is not appropriate to only consider those travelling by motor vehicle as part of the existing environment.

Given the time that has passed since the construction of the wind farm, the Chapter acknowledges that difficulties were encountered in estimating trip generation during construction. Consequently, a conservative approach has been taken to the estimation of trip generation, which is considered appropriate.

5.15.4 Response to Stakeholder Concerns

Public comments regarding the rEIAR have been made in relation to traffic management and the improvement of existing roads. The rEIAR states that a Traffic Management Plan (TMP) will be agreed with Galway County Council prior to mitigation, however details of the measures that might be included within the TMP are not specific. The measures should be directly related to the likely significant effects, and be specific, measurable, and time bound. In this respect the rEIAR has not addressed stakeholder concerns.

5.15.5 Effect of Decommissioning

The Chapter considers the impacts of traffic generated by personnel travelling to and from the site during decommissioning. The Chapter has assumed a 100% mode share for travelling by car and an occupancy of 1.25 workers per vehicle. At the peak of decommissioning, this results in 128 vehicular trips (64 arrivals and 64 departures) per working day. It is not made clear how many working days per week are assumed, therefore it is not possible to determine whether assessment of effects should be undertaken for a weekday, weekend day, or average day.

Whilst the percentage change in traffic volumes is identified for the M18, it is not identified for Black Road, R353, R380, and R458. In the absence of this data, it is not possible to determine the magnitude of impacts on any of these roads and therefore the significance of effects cannot be established. The EIA Directive requires that the consideration of likely significant effects accounts for the magnitude and spatial extent of the impact, neither of which are given in the Chapter.

The Chapter states that "impacts on Black Road and the surrounding local road network will be more significant given the low baseline levels which exist on the local road network." However, the significance of effects has not been derived from the sensitivity of the existing environment, which is not specified, nor the magnitude of the impact. As raised prior, no baseline traffic flow data nor proxy data is provided.

It should be noted that changes in traffic flows appear to have been taken as the impacts on the transport network. Changes in traffic flows are not impacts in themselves, rather changes in traffic flows result in impacts such as delay, severance, or accidents. These impacts do not appear to have been considered by the Chapter.

The Chapter forecasts an average maximum of 10 HGV trips per day for material removal (5 arrivals and 5 departures) and 10 abnormal load trips per day (5 arrivals and 5 departures) for removal of components. As with the trips generated by personnel, the significance of the effects caused by HGV trips has not been related to the sensitivity of the existing environment and the magnitude of impacts.

5.15.6 Effectiveness of Proposed Mitigation Measures

To mitigate the movement of abnormal loads during decommissioning, it is proposed that these movements would generally occur at night. As the significance of the effects of abnormal load movements, such as delay, severance, and accidents, has not been determined, it is not possible to comment on the effectiveness of the proposed mitigation measures. It is however noted that the movement of abnormal loads at night should be considered in the context of other topics, such as noise and ecology.

During decommissioning, it is proposed that a TMP is implemented to minimise impacts on the surrounding transport network and its users. As the geographic scope and mitigation of impacts has not been defined, and the sensitivity of the existing environment has not been classified, it is not possible to comment on the effectiveness of a TMP in mitigating any likely significant effects.

In this respect, the Chapter does not comply with the EIA Directive.

5.15.7 Recommendations for Further Mitigation Measures

No mitigation is currently proposed for the effects of travel by personnel. Following further assessment to understand whether there would be any significant effects resulting from this travel, the need for mitigation should be revisited.

Further information should be given on the measures to be included in the TMP, including the geographic and temporal scope of these measures.

The effects of HGV trips may require further mitigation if any of the effects are found to be significant. This should be clarified when further assessment is undertaken.

5.15.8 Additional Information or Evidence Required

It is considered that the following additional information and evidence is required to understand whether there would be any significant traffic and transport effects resulting from the decommissioning of the project:

- Baseline traffic flow data for Black Road, R353, R380, and R458.
- Classification of the existing environmental sensitivity of geographical areas within the study area.
- Calculation of the magnitude of traffic and transport impacts, such as delay, severance, accidents etc. within the study area.
- Determination of the significance of traffic and transport effects based upon the above.

This additional information and evidence should be provided for the decommissioning of the project to understand the need for and effectiveness of mitigation measures.

5.15.9 Reasonableness of Conclusions and Need for Possible Remedial Works

Given the deficiencies in the assessment outlined prior, it cannot be considered that the conclusions are reasonable as it is not possible to validate the likely significant effects. Further information is required, and this may alter the conclusions of the Chapter.

Notwithstanding the above, it is considered unlikely that any remedial works for the existing operation of the wind farm would be required for traffic and transport reasons, however further mitigation may be needed for the decommissioning of the project.

5.16 Cultural Heritage

5.16.1 Compliance with Legislation and Best Practice

Section 15.2.1 of Chapter 15 provides a description of the legal and planning framework relevant to Cultural Heritage. The legislation and policy presented is comprehensive. The Galway County Heritage and Biodiversity Plan 2017-2022 could have been included.

No best practice guidance is listed. A reference to the Institute of Archaeologists of Ireland Code of Conduct could have been included. Given the need for tree clearance to facilitate the development reference to the Code of Practice between Coillte and the Minister for the Environment and Local Government could also have been included.

5.16.2 Baseline Information

Section 15.1.1 states that the study area applied in the assessment is 3km from the site boundary for the windfarm and 100m either side of the Derrybrien-Agannygal 110kV Overhead line and Agannygal substation. While this study area is not inappropriate a larger study area would have allowed for a greater understanding of potential significant effects on heritage assets of the highest value such as designated Record of Monuments and Places (RMP) sites.

A desk-top study was carried out to inform the rEIAR. Baseline data was collected from:

- The Sites and Monuments Record (SMR)
- The Record of Monuments and Places (RMP) for County Galway
- The Record of Protected Structures (RPS)
- The National Inventory of Architectural Heritage (NIAH)
- County Galway Development Plan
- Historic Environment Viewer

Information on previous archaeological assessments within the study area including those prepared for planning applications associated with this development. It is noted that no report on the archaeological monitoring of the first construction phase of the wind farm during 2003 was available.

- UNESCO World Heritage Sites and Tentative List
- National Inventory of Architectural Heritage (NIAH)
- Database of Irish Excavation Reports
- National Museum of Ireland (NMI) Topographical Files
- National Monuments Service (NMS) Archives
- Historical publications and cartographic sources
- Aerial Imagery
- Placenames Database of Ireland
- Irish National Folklore Collection

A site visit was carried out in August 2018 and October 2019.

Section 15.1.4 of the chapter states that archaeological monitoring of ground works was carried out during the first phase of construction of the wind farm but the report on these works could not be sourced. The authors of the chapter made contact with the archaeologist who carried out the work and obtained written confirmation that nothing of archaeological significance was revealed in any area of the site.

Overall the desk-based sources consulted are comprehensive and appropriate. The lack of a report detailing the archaeological monitoring carried out during the first phase of the construction of the windfarm is unfortunate.

The baseline section identified one archaeological asset within the site boundary – a levelled cashel. It is noted in the Chapter that this record was not included in the RMP for Co. Galway or the SMR until 2015. It is possible that below ground remains associated with this asset could have been present during the construction of the windfarm. Section 15.2.3.2 notes that the asset is located in an area of a borrow pit for the windfarm which was archaeologically monitored and no remains recorded. However, the lack of a report detailing this monitoring does represent a gap in the record.

The windfarm site is located in an area of upland peat bog. Peat and peat bogs are well known to provide excellent preservation of organic remains and can be a fantastic source of palaeoenvironmental evidence. The chapter does not acknowledge this potential.

5.16.3 Appropriateness of Assessment Methodology and Significance Criteria

The impact assessment methodology and significance criteria applied in the chapter is based on ICOMOS Guidance on Heritage Impact Assessments for Cultural World Heritage Properties 2011 (Ref 59). This is appropriate.

5.16.4 Response to Stakeholder Concerns

No specific stakeholder concerns in relation to cultural heritage are raised.

5.16.5 Effect of Decommissioning

Section 15.2.7.3 of the Chapter deals with decommissioning, noting that the removal of above ground elements and underground cables will take place in previously disturbed ground, while other elements of the wind farm will be left in situ. Some regrading of land will take place following the removal of barrages 3 and 4. The Chapter focuses on the lack of known cultural heritage assets within the areas of proposed activity. It is silent on the prospect of previously unrecorded assets being impacted by decommissioning activities (in particular the land regrading) and does not consider the possibility of decommissioning activities presenting an opportunity to carry out investigations into the potential for archaeological preservation within the peat deposits.

5.16.6 Effectiveness of Proposed Mitigation Measures

The Chapter does not propose any mitigation measures for significant or non-significant adverse cultural heritage effects. However, it does state that "*All detailed proposals for the decommissioning of the wind farm and overhead line will be subject to an archaeological assessment to determine if ground works will be required in undisturbed areas outside the footprint of the existing development that may have the potential to impact on any unrecorded, sub-surface archaeological features or artefacts that may exist within the subject areas. Any such works will be subject to archaeological monitoring carried out by a suitably qualified archaeologist operating under a licence issued by the NMS*". It is therefore considered that some mitigation measures in the form of archaeological monitoring are being proposed. The effectiveness of these measures will depend on their exact scope and nature – assessment and monitoring that acknowledges and accounts for the potential for as yet unrecorded remains to be present, particularly within the peat deposits, will be more effective than assessment and monitoring that focuses solely on known heritage assets.

5.16.7 Recommendations for Further Mitigation Measures

The need for further mitigation measures will be identified if and when the proposed scope and methodology for the proposed assessment and monitoring is made available.

5.16.8 Additional Information or Evidence Required

A statement regarding the archaeological potential of the peat would be helpful. It would also be helpful for the scope of the proposed archaeological assessment and monitoring to be clarified and for that scope to appropriately consider the archaeological potential of the peat.

5.16.9 Reasonableness of Conclusions and Need for Possible Remedial Works

On balance the conclusions are reasonable and they do recognise that archaeological monitoring was carried out during construction of the windfarm, in the peat slide area and during remedial works. There is a reliance on records of known heritage assets and there is a slight omission in considering the archaeological potential of peat deposits.

5.17 Major Accidents and Disasters

5.17.1 Compliance with Legislation and Best Practice

Chapter 16 of the rEIAR sets out the requirement to consider Major Accidents and Disasters as required by the EIA Directive. It correctly references Annex IV (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); and 8 which states the following:

'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 (1) or Council Directive 2009/71/Euratom (2) 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'.

However, the Chapter notes that an assessment of major accidents was not required at the time the permission was granted.

The Chapter also sets out the wider United Nations and EU Policy content on natural and man-made disasters and how the topic was integrated into the EIA Directive. It goes on to set out the National, Regional and Local emergency management frameworks.

5.17.2 Baseline Information

Section 16.4 presents the baseline information (receiving environment) across five key aspects set out in the Framework for Major Emergency Management 2006 (MEM Framework) (Ref 60).

The Chapter provides a sufficient description of the social, natural hazards, infrastructure and hazardous sites and provides a detailed account of the Derrybrien peat slide that occurred in 2003. This detailed account makes reference to investigations undertaken to identify the cause of the land slide. However, the baseline lacks a detailed review of the baseline conditions of the peat at the site prior to the land slide.

5.17.3 Appropriateness of Assessment Methodology and Significance Criteria

The scope of the assessment is comprehensive considering the construction phases 2003 and 2003 - 2006, the peat slide which occurred in 2003, the operational phase from 2006 to circa 2040 and the decommissioning phase.

The methodology clearly sets out how risks have been evaluated using an Emergency Risk Rating Matrix that draws from the classification of likelihood and ranking of impact criteria derived from the 2010 guidance produced for Principal Response Agencies by the Department of Environment, Heritage and Local Government (DOEHLG) (Ref 61) in relation to emergency management. However, no link is made between the risk ratings and 'Significance of Effect' in terms of the EIA Directive. In order for the consenting authority to properly consider the effects of potential accidents/hazards it is necessary for the resulting significance of effects on receptors to be understood. The assessment methodology does not provide a framework to make these links.

5.17.4 Response to Stakeholder Concerns

There is no evidence within the Chapter of any response to stakeholder concerns. This is a major omission given the significant concerns stakeholders have following the peat slide in 2003 where public roads and bridges were inaccessible for long periods of time and watercourses were blocked with peat.

Recently the developer has placed a Hazard sign at the entrance to the turbary stating that there is a risk of instability if peat cutting activities are undertaken. This prevents the local residents from obtaining a fuel supply for use next winter but has also heightened concerns about site stability, despite continued assurances from the developer (and repeated in the rEIAS) that mitigation measures have rendered the site safe. See Section 5.11.4 and Appendix C for details.

5.17.5 Effect of Decommissioning

Section 16.5.4 covers the effects from decommissioning the project but provides no evidence to demonstrate that the decommissioning phase would not increase the risk of a further peat slide. It simply states that the operation phase will continue to reduce the risk due to the drainage improvement and sustained loading of the peat from the constructed infrastructure. However, in Chapter 10 the report states that the drainage structures would not be maintained following decommissioning and would likely become obstructed by debris. It is incongruous to state on one hand state that maintenance of a robust drainage system is vital for site stability but that following decommissioning maintenance will stop and permit the drainage system to fail having undertaken no mitigating management to stabilise such a future scenario.

5.17.6 Effectiveness of Proposed Mitigation Measures

Prior to the peat slide and in absence of mitigation measures the peat stability risk assessment determined that the risk of a peat slide was likely. Following the implementation of mitigation measures in the second phase of construction (after the peat slide occurred), the peat stability risk assessment found the risk to be reduced to very unlikely to unlikely

During operation no further mitigation measures are proposed and it is stated that 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. This

does not take into account the projected impacts of climate change that may lead to peat slides resulting from periods of drought and/or heavy rainfall.

5.17.7 Recommendations for Further Mitigation Measures

Given the repeated evidence of slope failure both on the site itself, in the surrounding landscape, and *across Ireland as a whole, is that some form of suitable restoration intervention will be required on the* Derrybrien site prior to completion of decommissioning to ensure long-term stability of the area (See Section 5.11).

Either a long-term maintenance plan following decommissioning should be implemented or works to restore the peat to a point where long term maintenance is not required should be considered.

5.17.8 Additional Information or Evidence Required

The principal concern relating to Major Accidents and Hazards for this project is the risk of a further peat slide. The rEIAR provides an assessment that concludes that the continued operation of the windfarm will reduce the risk of further peat slides but provides little evidence to justify this. As outlined in section 5.18.5, further evidence is required to demonstrate that following decommissioning, the risk of a peat slide will not increase.

5.17.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The assessment concluded that conditions on the windfarm site were suitable for the project with appropriate design and mitigation measures for working in peat based on The Landslide Susceptibility Map.

The report also concludes that wind farm activities for the decommissioning phase are not expected to result in any further peat slides. This is attributed to the current improved site conditions that will remain for the operation phase (until 2040) and it is stated 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 in the assessment. Without sufficient evidence to substantiate this claim, this conclusion is unreasonable. See Section 5.12 for details.

5.18 Interaction of Impacts

5.18.1 Compliance with Legislation and Best Practice

The Chapter sets out the requirement to consider interaction of impacts under Article 3.1 (e) of the EIA Directive and the EC guidance on the preparation of EIARs. This highlights Point (e) which sets out the need to consider the interaction between the different factors of the assessment.

5.18.2 Baseline Information

Baseline information is set out in each of the technical chapters. It is appropriate that it is not repeated in the Interaction of Impacts Chapter.

5.18.3 *Appropriateness of Assessment Methodology and Significance Criteria*

The Chapter states that the assessment methodology has followed the EPA Guidance Section 3.7 Interactions between Impacts of Different Factors. However, a description of the matrix (which underpins the EPA methodology) and how it works is not provided. Effects and their significance appear to have been described sporadically throughout the chapter without consistent use of the impact characteristics and the degree / nature of the effect.

The assessments are high level in nature and do not provide sufficient detail to justify conclusions within this chapter, although it is noted that reference is made to other chapters within the rEIAR where *further information is provided.*

In terms of intra project cumulative impacts, the report states that these are considered in the technical chapters. However, the methodology for identifying the other projects with the potential for cumulative effects set out in Section 2.5 is not provided.

5.18.4 Response to Stakeholder Concerns

The South Galway Flood Relief Committee raised that the cumulative effects of forestry felling and operations have not been considered in the rEIAR.

No response to stakeholder concerns is provided.

5.18.5 *Effect of Decommissioning*

The effects of decommissioning are set out across all the technical topics.

5.18.6 Effectiveness of Proposed Mitigation Measures

No mitigation measures are proposed to ameliorate cumulative effects. For the most part this is acceptable as the assessment does not report any significant cumulative effects that require mitigation. However, in Section 17.3.2.3 the assessment identifies minor, negative temporary impacts that rely on the road widening activities been 'properly planned and supervised'. Further details should be provided to expand on what this means.

5.18.7 Recommendations for Further Mitigation Measures

Please see the technical sections for recommendations for further mitigation measures.

5.18.8 Additional Information or Evidence Required

The assessment methodology would benefit from a description of how individual effects are combined to determine a resulting effect significance. For instance, does the combined effect significance default to the most significant individual effect; do multiple minor effects combine into a more significant effect; or is the assessment made on a qualitative basis.

The assessment should clearly set out how the conclusions on cumulative effects have been reached using a consistent methodology. A review of potential tree feeling cumulative effects on ecological features and hydrology should be considered as a minimum.

5.18.9 Reasonableness of Conclusions and Need for Possible Remedial Works

The assessment presents effects identified in the technical chapters with the potential cumulative effects but does not include an assessment to properly consider how these effects may interact to result in a potentially more significant residual effect.

The assessment also excludes cumulative tree felling impacts stating that "only the impact of felling associated with the wind farm project was considered and any other felling carried out in the area during construction and following commissioning is beyond the study scope". Given that the project involved the felling of 222ha of forest, this is considered to be a major omission from the assessment.

5.19 Summary of Remedial Measures

When setting out the scope of the Chapter reference is made to clause 177F. – (1) of the Planning and Development Act 2000 highlighting the requirement to set out any appropriate remedial measures undertaken or proposed to be undertaken by the applicant for substitute consent to remedy any significant adverse effects on the environment.

The chapter provides a useful summary of all the remedial measures identified in the technical chapters setting out their duration, stage of impact and status. The presentation of the measures is comprehensive and easy to follow.

Discussion of the effectiveness of the proposed remedial measures is presented in each of the technical chapter reviews (Sections 5.6-5.19).

6 Conclusions

In terms of scope, the rEIAR satisfies most of the content requirements of the EIA Directive as set out in Articles 3 and 5. The exception is the requirement to estimate quantities and types of waste as set out in Annex IV. The rEIAR only provides a short passage of text setting out that all demolition waste *will be removed from site and reused / recycled where possible. Considering the scale of the* decommissioning activities (i.e., removal of 70 turbines), this is a major omission and renders the rEIAR non-compliant with the EIA Directive.

Although the rEIAR references the most up to date best practice guidance, a scoping process was not undertaken which is considered to be a very important best practice activity to ensure that the assessment addresses all the key issues with agreement from statutory consultees. The lack of a scoping process is evident in the complaints from statutory consultees such as the South Galway Flood Relief Committee.

In accordance with the EIA Directive, a five-week participation window was provided for public consultation on the rEIAR following submission. Whilst there has been an opportunity for public participation to take place, there is a question mark over the effectiveness of participation enabled by this opportunity, given the complex nature of the topic, the volume of application documents and the reasonableness of the timeframe for comments / inputs by members of the public. The rEIAR Non-Technical Summary states "Gort Wind Farms Limited has engaged with the general public in relation to the Derrybrien Wind Farm Project throughout the development and operation of the Project." All of the complaints received by the EC contradict this claim and a complaint was made by a local resident that although there was a 30-day public consultation period starting on 21 August 2020, the documentation was not accessible until 27 August 2020.

In compliance with the EIA Directive the rEIAR considers alternatives, however, it is questionable how likely the developer is to develop alternative energy projects on the site and therefore how far these constitute reasonable alternatives. The most relevant reasonable alternatives are decommissioning and remediation options. In comparison to the other alternatives considered in the rEIAR, this alternative is given very brief consideration, and the reasons for selecting the chosen option are not dealt with in any detail. The removal of one or more parts of the development should be considered as a reasonable alternative. Neither changes to the current operational site nor alternatives during decommissioning have been considered. In conclusion, whilst it is considered that the consideration of alternatives largely meets the requirements of the EIA Directive, its usefulness to decision makers is questionable and full consideration of reasonable alternatives during decommissioning has not be covered sufficiently.

The assessment methodology for the rEIAR is clearly set out in the introductory chapters and supplemented by chapter specific methodologies and effect significance criteria. However, inadequacies have been identified in the methodologies for the Population and Human Health; Terrestrial Biodiversity; Landscape and Visual; Traffic and Transport; Soils, Land and Geology; Material Assets and Interaction of Impacts assessments. Inadequacies include invalid survey methods and not applying the stated significance criteria within the assessments. These inadequacies invalidate the conclusions of some assessments, and the appropriateness and effectiveness of the proposed mitigation measures cannot subsequently always be determined.

Given that construction is complete, decommissioning should be a key focus of the rEIAR. It is therefore welcomed that all the technical assessments include a section dedicated to the consideration of the effects of decommissioning. However, the conclusions that the assessments come to regarding adverse effects during and after decommissioning are not sufficiently evidenced.

The Soils, Land and Geology and the Major Hazards and Accidents chapters provide no evidence to demonstrate that the decommissioning phase would not increase the risk of a further peat slide. It simply states that the operation phase will continue to reduce the risk due to the drainage improvement and sustained loading of the peat from the constructed infrastructure. However, in Chapter 10 the report states that the drainage structures would not be maintained following decommissioning and would likely become obstructed by debris. It is incongruous to on one hand state that maintenance of

a robust drainage system is vital for peat stability but that after decommissioning maintenance will stop and permit the drainage system to fail having undertaken no mitigating management to stabilise such a future scenario.

The rEIAR adequately describes the emergency mitigation undertaken following the peat slide. However, the mitigation proposed during operation and decommissioning are in some cases inadequate and lack evidence to demonstrate their efficacy. The following points highlight the key concerns relating to the proposed mitigation or lack thereof.

- With regard to noise, additional mitigation especially during decommissioning relative to weekend working is required. There is no specification of how decommissioning activities would be monitored to ensure compliance with appropriate thresholds. This would need to be specifically considered within any Environmental Management Plans or Codes of Practice necessary for the decommissioning works and would require detailed measures to be presented for control and monitoring of decommissioning activities.
- With regard to Biodiversity, there appears to be significant lack of mitigation proposed during both operation and decommissioning. No mitigation is proposed for terrestrial habitats following the emergency peat slide mitigation and monitoring is not mentioned. Bird monitoring of Hen Harrier will continue at 3-year intervals and flight diverters will be erected on the OHL but no other bird monitoring is proposed. For bats, no monitoring is proposed to evaluate the success of additional roosting provision. There is also no monitoring for mammals proposed which is considered a significant omission. It is recommended that an overarching management and monitoring plan should be provided, detailing the receptors, surveys, years of survey and management required over the years up to decommissioning (see Section 6.8.10 for details).
- In terms of peat instability, monthly visual inspections supplemented by an annual walkover by a qualified geoengineer, and maintenance of the drainage system are proposed. No other mitigation measures are offered by the rEIAR. There is currently no automated instrumental monitoring anywhere on the site and there are no plans to install any such instrumentation. The only 'quantitative' monitoring devices now are seven 'sighting poles' designed to detect by eye whether there is any sign of peat movement. The remainder of the site has no monitoring devices. Consequently, there is no means of judging the effectiveness of the two systems of mitigation measures currently employed. Tests should be started now to determine the best approach, or approaches, for stabilising the site into the long term. For instance, there is case study evidence for the success in using old salmon-farm netting to stabilise eroding peat slopes and establishing new growth of peat-forming Sphagnum swards (see Section 5.11). Tests might be undertaken to explore the potential of combining netting, or jute netting with the use of 'soil nails'. Either a long-term maintenance plan following decommissioning should be implemented or works to restore the peat to a point where long-term maintenance is not required should be considered.

Based on the technical review of the rEIAR against the requirements of the EIA Directive, it is recommended that further information is provided before the consenting authority can make an informed decision on this application. With the exception of the omission of an assessment of the likely significant effects of the project on the environment resulting from the disposal of waste, the rEIAR is generally in accordance with the requirements of the EIA Directive. However, inadequacies have been identified within the assessments which lead to uncertainty around the validity of the conclusions and the suitability and effectiveness of proposed mitigation. In addition, omissions in the required mitigation have been identified, specifically relating to terrestrial ecology and peat stability. Specifically, more evidence is required to demonstrate that following decommissioning the site will be returned to a state in which there is not an unacceptable risk of further peat slides.

7 List of Consulted Sources

Table 7-1 List of Consulted Sources

Ref No.	Consulted Source
Ref 1	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 on the assessment of the effects of certain public and private projects on the environment. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052
Ref 2	Directive 92/43/EEC of the European Parliament and of the Council of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31992L0043
Ref 3	Commission v Ireland (C-215/06, EU:C:2008:380) Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:62006CJ0215
Ref 4	Directive 85/337/EEC of the European Parliament and of the Council of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A31985L0337
Ref 5	Directive 97/11/EC of the European Parliament and of the Council 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31997L0011
Ref 6	Commission v Ireland (C-261/18, EU:C:2019:955) Available at: https://curia.europa.eu/juris/liste.jsf?language=en&td=ALL&num=C-261/18
Ref 7	Planning and Development Act 2000, No.30/2000 Available at: http://www.irishstatutebook.ie/eli/2000/act/30/enacted/en/html
Ref 8	An Taisce v. An Bord Pleanala, Supreme Court of Ireland, 1 July 2020. Available at: https://courts.ie/view/judgments/80f2cbbf-4f1e-4065-8ca3-f8c14308035b/db51b036-dd26-4b57-86b6-59ac6d4d2b31/2020_IESC_39.pdf/pdf
Ref 9	European Commission (2017), Environmental Impact Assessment of Projects: Guidance on Scoping. Available at: https://ec.europa.eu/environment/eia/pdf/EIA_guidance_Scoping_final.pdf
Ref 10	Environmental Protection Agency, (2017), Guidelines on the Information to be Contained in EIARs (draft) Available at: https://www.epa.ie/pubs/advice/ea/EPA%20EIAR%20Guidelines.pdf
Ref 11	Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment Available at: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32001L0042
Ref 12	British Standards Institution (2014), Code of practice for noise and vibration control on construction and open sites. BS 5228-1:2009+A1:2014
Ref 13	ETSU-R-97:The Working Group on Noise from Wind Turbines (1996), The Assessment and Rating of Noise from Wind Farms (ETSU R97). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf
Ref 14	*Institute of Acoustics (2013), Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating* of Wind Turbine Noise as the Main Vehicles for Assessment Available at: https://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf

Ref No.	Consulted Source
Ref 15	British Standards Institution (1993), Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration. BS 7385: Pt2: 1993
Ref 16	Department of Housing, Local Government and Heritage (2006), Wind Energy Development Guidelines Available at: https://www.gov.ie/en/publication/f449e-wind-energy-development-guidelines-2006/
Ref 17	Department of Housing, Planning and Local Government (2019), Wind Energy Development Guidelines (draft) Available at: https://www.gov.ie/en/publication/9d0f66-draft-revised-wind-energy-development-guidelines-december-2019/
Ref 18	Department of Housing, Planning and Local Government (2019) Revised Wind Energy Development Guidelines Available at: https://www.gov.ie/en/consultation/8f3c71-public-consultation-on-the-revised-wind-energy-development-guideline/
Ref 19	Luc (2017), The Review of Light and Shadow Effects from Wind Turbines in Scotland Available at: https://www.climatexchange.org.uk/media/2075/light_and_shadow_effects_from_wind_turbines_in_scotland_stages_1_and_2.pdf
Ref 20	The Flora (Protection) Order, S.I. 356/2015 Available at: http://www.irishstatutebook.ie/eli/2015/si/356/made/en/print
Ref 21	Department of Housing Planning and Local Government, (2018), Project Ireland 2040 National Planning Framework Available at: https://npf.ie/project-ireland-2040-national-planning-framework/
Ref 22	Galway County Council, (2018), Galway County Heritage and Biodiversity Plan 2017-2022, available at: https://dpdgay9x1sxad.cloudfront.net/wp-content/uploads/sites/6/2020/05/Galway-County-Heritage-and-Biodiversity-Plan-2017-2022.pdf
Ref 23	Department of Arts, Heritage and the Gaeltacht (2011) Actions for Biodiversity 2011-2016, Ireland's 2nd National Biodiversity Plan Available at: https://www.npws.ie/sites/default/files/publications/pdf/Biodiversity%20Plan%20text%20English.pdf
Ref 24	*Collins, J. (ed) (2016) Bat Surveys for the Professional Ecologists: Good Practice Guidelines (3rd edn.) Available at:* https://cdn.bats.org.uk/pdf/Resources/Bat_Survey_Guidelines_2016_NON_PRINTABLE.pdf?mtime=20181115113931&focal=none
Ref 25	Chartered Institute of Ecology and Environmental Management. (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf
Ref 26	the Department of Environment, Heritage and Local Government (DEHLG) (2010), National guidance for planning authorities on Appropriate Assessment of plans and projects in Ireland, Available at: https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf
Ref 27	Royal Society for the Protection of Birds, BirdWatch Ireland (2013) Bird species of medium and high conservation concern listed in the publication Birds of Conservation Concern in Ireland (BoCCI) 2014 – 2019, Available at: https://birdwatchireland.ie/birds-of-conservation-concern-in-ireland/
Ref 28	Wray, S., Wells, D., Long, E. & Mitchell-Jones, T. (2010) Valuing bats in ecological impact assessment. In Practice: *Institute of Ecology and Environmental Management*, No 70 Available at: https://cieem.net/wp-content/uploads/2019/01/InPractice70.pdf
Ref 29	Rodrigues, L., Bach, L., Dubourg-Savage, M-J., Karapandza, B., Kovac, D., Kervyn, T., Kepel, A., Bach, P., Collins, J., Harbusch, C., Park, K., Micevski, B., Minderman, J. (2015) Guidelines for consideration of bats in wind farm

Ref No.	Consulted Source
	projects - Revision 2014. EUROBATS, No. 6. Available at: https://www.eurobats.org/sites/default/files/documents/publications/publication_series/pubseries_no6_english.pdf
Ref 30	Chartered Institute of Ecology and Environmental Management. (CIEEM) (2021), Guidance on Ecological Survey and Assessment in the UK During the COVID-19 Outbreak Version 4 https://cieem.net/wp-content/uploads/2020/06/CIEEM-Guidance-on-Alternative-Approaches-v4-FINAL.pdf
Ref 31	Scottish Natural Heritage (2014), Recommended bird survey methods to inform impact assessment of onshore wind farms, Available at: https://www.nature.scot/sites/default/files/2017-09/Guidance%20note%20-%20Recommended%20bird%20survey%20methods%20to%20inform%20impact%20assessment%20of%20onshore%20windfarms.pdf
Ref 32	Norriss, D.W., Marsh, J., McMahon, D. & Oliver, G.A. 2002. A national survey of breeding Hen Harriers Circus *cyaneus in Ireland 1998- 2000. Irish Birds 7: 1-10*
Ref 33	Hundt, L., (2012), Bat Surveys for Professional Ecologists: Good Practice Guidelines (2nd edition)
Ref 34	National Roads Authority (2006b) Guidelines for the Treatment of Otters prior to the Construction of National Roads Schemes, Available at: https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Otters-prior-to-the-Construction-of-National-Road-Schemes.pdf
Ref 35	Scottish Natural Heritage, (2017), Technical Advice Note 2 for Otter Surveys Available at: https://www.scotborders.gov.uk/technicaladvicenotes
Ref 36	National Roads Authority (2006a) Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes, Available at: https://www.tii.ie/tii-library/environment/construction-guidelines/Guidelines-for-the-Treatment-of-Badgers-prior-to-the-Construction-of-a-National-Road-Scheme.pdf
Ref 37	Percival (2003) Birds and Wind Farms in Ireland: A Review of Potential Issues and Impact Assessment, Available at: https://tethys.pnnl.gov/sites/default/files/publications/Percival_2003.pdf
Ref 38	Henry, A., 2018. Bat roosts in trees: A Guide to Identification and Assessment for Tree-Care and Ecology *Professionals, 1st ed. Exeter: Pelagic Publishing.*
Ref 39	Garry Mortimer Foraging, roosting and survival of Natterers bat in a commercial coniferous plantation (2016) Available at: https://core.ac.uk/download/pdf/30318922.pdf
Ref 41	Suzanne Mary Richardson, to the University of Exeter as a thesis for the degree of Doctor of Philosophy in Biological Sciences, November 2015 https://ore.exeter.ac.uk/repository/bitstream/handle/10871/22087/RichardsonS.pdf?sequence=1
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Ref 44	Waldron, S., Flowers, H., Arlaud, C., Bryant, C., and McFarlane. S., (2009). The significance of organic carbon and nutrient export from peatland-dominated landscapes subject to disturbance, a stoichiometric perspective. *Biogeosciences* 6: p363–374.
Ref 45	Kurz, I. and Costello, M.J. (1999) An outline of the biology, distribution and conservation of lampreys in Ireland. *Irish Wildlife Manuals*, No. 5. 27pp. Dublin: Du´chas—The Heritage Service.
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Ref No.	Consulted Source
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Ref 47	Kelly, F.L. and King, J.J. (2001) A review of the ecology and distribution of three lamprey species, Lampetra fluviatilis (L.), Lampetra planeri (Bloch) and Pteromyzon marinus (L.): a context for conservation and biodiversity in Ireland. *Biology and Environment: proceedings of the Royal Irish Academy*, 101B(3), 165-185.
Ref 48	Lindsay, R. and Bragg, O., (2005). Wind Farms and Blanket Peat - a report on the Derrybrien bog slide. Available at: https://repository.uel.ac.uk/item/867x7
Ref 49	Landscape Institute and Institute for Environmental Management and Assessment (IEMA) (2013), Guidelines for Landscape and Visual Impact Assessment (GIVIA). 3rd edition, Routledge
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Ref 51	Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey. Guidance on Developments on Peatland, Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2018/12/peatland-survey-guidance/documents/peatland-survey-guidance-2017/peatland-survey-guidance-2017/govscot%3Adocument/Guidance%2Bon%2Bdevelopments%2Bon%2Bpeatland%2B-%2Bpeatland%2Bsurvey%2B-%2B2017.pdf
Ref 52	Pyatt, D.G. and John, A.L., 1989. Modelling volume changes in peat under conifer plantations. Journal of Soil Science, 40(4), pp.695-706.; Anderson, R., 2001. Deforesting and Restoring Peat Bogs. Available at: https://luk.staff.ugm.ac.id/rawa/Anderson-Deforesting-RestoringPeatBogs.pdf
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Ref 59	International Council on Monuments and Sites (ICOMOS), (2011), Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, Available at: https://www.iccrom.org/sites/default/files/2018-07/icomos_guidance_on_heritage_impact_assessments_for_cultural_world_heritage_properties.pdf
Ref 60	Framework for Major Emergency Management 2006 (MEM Framework). Available at: http://mem.ie/wp-content/uploads/2015/05/A-Framework-For-Major-Emergency-Management.pdf
Ref 61	Department of Environment, Heritage and Local Government (DOEHLG), (2010) Guidance produced for Principal Response Agencies

APPENDIX A

ES Review Checklist

SECTION 1 DESCRIPTION OF THE PROJECT				
No.	Review Question	Relevant?	Adequately Addressed?	What further information is needed?
The Objectives and Physical Characteristics of the Project				
1.1	Are the need for and objectives of the project explained?	Yes	Yes	
1.2	Is the programme for implementation of the Project described, detailing the estimated length of time and start and Finnish dates for construction, operation and decommissioning? (this should include any phases of different activity within the main phases of the Project, for example extraction phases for mining operations)	Yes	Yes	
1.3	Are all the main components of the project described (for assistance see the Checklist of Project Activities in Part C of the Scoping Guide in this series)	Yes	Yes	
1.4	Is the location of each Project component identified, using maps, plans and diagrams as necessary?	Yes	Yes	
1.5	Is the layout of the site (or sites) occupied by the project described? (including ground levels, buildings, other physical structures, underground works, coastal works, storage facilities, water features, planting, access corridors, boundaries)	Yes	Yes	
1.6	For linear projects, are the route corridor, the vertical and horizontal alignment and any tunnelling and earthworks described?	Yes	No	The corridor used for the grid connection is not appropriate in its presented form, being constrained to a simple constant width (without justification or explanation) and all associated information being restricted to that width, whereas ground conditions should have been used to dictate the appropriate corridor width (and environmental impact

				information provided) for any given section of the grid connection route.
1.7	Are the activities involved in construction of *the project all described?*	Yes	Yes	
1.8	Are the activities involved in operation of the project all described?	Yes	Yes	
1.9	Are the activities involved in decommissioning the project all described? (e.g. closure, dismantling, demolition, clearance, site restoration, site re-use etc.)	Yes	No	No site restoration details are offered. Instead, the developer proposes simply to leave the site to the effects of natural processes (good and bad) after removal of above-ground infrastructure.
1.10	Are any additional services required for the project all described? (e.g. transport access, water, sewerage, waste disposal, electricity, telecoms) or developments (e.g. roads, harbours, powerlines, pipelines)	Yes	Yes	
1.11	Are any developments likely to occur as a consequence of the Project identified? (e.g. new housing, roads, water or sewerage infrastructure, aggregate extraction)	No	N/A	
1.12	Are any existing activities which will alter or cease as a consequence of the Project identified?	Yes	No	It appears that traditional use of turbary rights may no longer be possible as a result of the development, due to instability which, it is reasonable to suggest, may have been initiated by changed drainage patterns established by the development. Investigation of these potential impacts would thus be required. It may also be the case that downstream river management (e.g. siltation) and flood mitigation will be required as a result of more rapid drainage from the hill slopes, requiring regular monitoring of sediment loads and water flows.
1.13	Are any other existing or planned developments with which the Project could have cumulative effects identified?	Yes	Yes	
The Size of the Project				

1.14	Is the area of land occupied by each of the permanent project components quantified and shown on a scaled map? (including any associated access arrangements, *landscaping and ancillary facilities)*	Yes	No	Areas cited in the report are inconsistent. Ecology Chapter states that "preconstruction the 344.5 ha wind farm site had 265 ha of conifer plantation of which 222 ha was felled to facilitate construction of the wind farm". Material Assets Chapter states The mitigation section of the Chapter states that the total area of the forestry felled was circa 150 ha. Confirmation of areas felled is required.
1.15	Is the area of land required temporarily for construction quantified and mapped?	Yes	Yes	

SECTION 1 DESCRIPTION OF THE PROJECT				
No.	**Review Question**	**Relevant?**	**Adequatel y**	**What further information is needed?**
1.16	Is the reinstatement and after use of land occupied temporarily for operation of the Project described? (e.g. land used for mining or quarrying)	Yes	Yes	
1.17	Is the size of any structures or other works developed as part of the Project identified? (e.g. the floor area and height of buildings, the size of excavations, the area or height of planting, the height of structures such as embankments, bridges of chimneys, the flow or depth of water)	Yes	Yes	
1.18	Is the form and appearance of any structures or other works developed as part of the Projectdescribed? (e.g. the type, finish and colour of materials, the architectural design of buildings and structures, plant species, ground surfaces, etc.)	Yes	Yes	Given that the project is operational some supplementary photographs of the Development would be beneficial.
1.19	For urban or similar development projects, arethe numbers and other characteristics of new populations or business communities described?	No	N/A	
1.20	For projects involving the displacement of people or businesses, are the numbers and other characteristics of those displaced described?	No	N/A	
1.21	For new transport infrastructure or projects generating substantial traffic flows, is the type, volume, temporal pattern and geographical distribution of new traffic generated or divertedas a consequence of the Project described?	Yes	No	Whilst total increases in traffic during decommissioning are quantified, the number of vehicles per road link is not specified. Existing traffic flows are also not provided, therefore the total volume of traffic during decommissioning is not understood.
Production Processes and Resources Used				
1.22	Are all the processes involved in operating theProject described? (e.g. manufacturing or engineering processes, primary raw material production, agricultural or forestry production methods, extraction processes)	Yes	Yes	
1,23	Are the types and quantities of outputs produced by the Project described? (these could be primary or manufactured products, goods such as power or water or services such as homes, transport, retailing,	Yes	Yes	

	recreation, education, municipal services (water, waste, etc.))			
1.24	Are the types and quantities of raw materials and energy needed for construction and operation discussed?	Yes	No	Types of raw materials used in the construction are identified in Chapter 2. Quantities only given for some of the materials (concrete and crushed rock material). A Material Resources Chapter should be provided to set out the project's impact on the depletion of natural resources.
1.25	Are the environmental implications of the sourcing of raw materials discussed?	Yes	Yes	
1.26	Is efficiency in use of energy and rawmaterials discussed?	Yes	No	With the exception of using on site borrow pits (and associated reduction in materials movements), no further reference is made to measures taken to reduce the use of raw materials/use of energy.
1.27	Are any hazardous materials used, stored, handled or produced by the Project identified and quantified? • during construction • during operation • during decommissioning	Yes	Yes	

SECTION 1 DESCRIPTION OF THE PROJECT					
No.	**Review Question**		**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
1.28	Are the transport of raw materials to the Project and the number of traffic movementsinvolved discussed? (including road, rail and sea transport) • during construction • during operation • during decommissioning	Yes	No	Whilst total volumes of traffic are given during decommissioning, this has not been disaggregated into increases per road link. This additional information and evidence should be provided for the decommissioning of the project to understand the need for and effectiveness of mitigation measures.	
1.29	Is employment created or lost as a result of the Project discussed? • during construction • during operation • during decommissioning	Yes	No	Failure of stability within the turbary area currently prevents access by the operator normally contracted by local stakeholders to obtain their winter fuel. The developers claim that the instability is not caused by their actions but available evidence suggests the possibility of a link. Investigation of the hydrological linkages between the windfarm drainage pattern and the identified zone of seepage associated with the areas of turbary slope failure is required.	
1.30	Are the access arrangements and the number of traffic movements involved in bringing workers and visitors to the Project estimated? • during construction • during operation • during decommissioning	Yes	No	Whilst access arrangements and total volumes of traffic associated with personnel are given, this is not disaggregated to the link level.	
1.32	Is the housing and provision of services for any temporary or permanent employees for the Project discussed? (relevant for Projects requiring migration of a substantial new workforce into the area for either construction or the long term)	No	N/A		
Residues and Emissions					

1.33	Are the types and quantities of solid waste generated by the Project identified? (including construction or demolition wastes, surplus spoil, process wastes, by-products, *surplus or reject products, hazardous wastes*, household or commercial wastes, agricultural or forestry wastes, site clean-up wastes, mining wastes, decommissioning wastes) • during construction • during operation • during decommissioning	Yes	No	Types of construction waste are identified but it is stated that construction waste quantities were not available for use in the rEIAR. However this information could have been estimated based on known construction details. No forecast quantities of waste during decommissioning are provided. A waste assessment should be undertaken to consider the likely significant effects of the project on the environment resulting from the disposal *and recovery of waste.*
1.34	Are the composition and toxicity or other hazards of all solid wastes produced by the Project discussed?	Yes	Yes	
1.35	Are the methods for collecting, storing, treating, transporting and finally disposing ofthese solid wastes described?	Yes	Yes	
1.36	Are the locations for final disposal of all solid wastes discussed?	Yes	Yes	
1.37	Are the types and quantities of liquid effluents generated by the Project identified? (including site drainage and run-off, process wastes, cooling water, treated effluents, sewage) • during construction • during operation • during decommissioning	No	N/A	Regular (at least monthly and ideally weekly) monitoring for DOC, POC and sediment load is required for all watercourses leaving the development site into all connected catchments.
1.38	Are the composition and toxicity or other hazards of all liquid effluents produced by theProject discussed?	No	N/A	
1.39	Are the methods for collecting, storing, treating, transporting and finally disposing ofthese liquid effluents described?	No	N/A	

SECTION 1 DESCRIPTION OF THE PROJECT				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
1.40	Are the locations for final disposal of all liquid effluents discussed?	No	N/A	
1.41	Are the types and quantities of gaseous and particulate emissions generated by the Project identified? (including process emissions, fugitive emissions, emissions from combustion of fossil fuels in stationary and mobile plant, emissions from traffic, dust from materials handling, odours) • during construction • during operation • during decommissioning	Yes	No	Although carbon emissions from the development are presented as collective numbers derived from the various modules of the Scottish Government Carbon Calculator, individual input values are not presented. Consequently the collective numbers offered cannot be verified. These individual input values should be supplied, together with an explanation for each value used.
1.42	Are the composition and toxicity or other hazards of all emissions to air produce by the Project discussed?	No	N/A	
1.43	Are the methods for collecting, treating and finally discharging these emissions to air described?	No	N/A	
1.44	Are the locations for discharge of all emissions to air identified and the characteristics of the discharges identified? (e.g. height of stack, velocity and temperature of release)	No	N/A	
1.45	Is the potential for resource recovery from wastes and residues discussed? (including re-use, recycling or energy recovery from solid waste and liquid effluents)	Yes	No	A waste chapter should be provided which sets out the re-use and recycling rates.
1.46	Are any sources of noise, heat, light or electromagnetic radiation from the Project identified and quantified? (including equipment, processes, construction works, traffic, lighting, etc.)	Yes	Yes	
1.47	Are the methods for estimating the quantities and composition of all residues and emissions identified and any difficulties discussed?	No	N/A	
1.48	Is the uncertainty attached to estimates of residues and emissions discussed?	No	N/A	
Risks of Accidents and Hazards				

1.49	Are any risks associated with the Project discussed? • risks from handling of hazardous materials • risks from spills fire, explosion • risks of traffic accidents • risks from breakdown or failure ofprocesses or facilities • risks from exposure of the Project to natural disasters (earthquake, flood, landslip, etc.)	Yes	No	The risk of a further peat slide following decommissioning is not adequately addressed.
1.50	Are measures to prevent and respond to accidents and abnormal events described? (preventive measures, training, contingency plans, emergency plans, etc.)	Yes	No	A contingency plan has not been prepared to address the risk of a further peat slide even this was recommended in the AGEC (2004) report.

SECTION 2 CONSIDERATION OF ALTERNATIVES				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
2.1	Is the process by which the Project was developed described and are alternatives considered during this process described? (for assistance, see the guidance on types of alternatives which may be relevant in Part B3 of the Scoping Guide in this series)	Yes	Yes	
2.2	Is the baseline situation in the No Project situation described?	Yes	Yes	
2.3	Are the alternatives realistic and genuine alternatives to the Project?	Yes	No	Consideration of alternative renewable technologies on the site do not seem realistic or genuine alternatives. The decommissioning and remediation options are given very brief consideration, and the reasons for selecting the chosen option are not dealt with in much detail. Further consideration of remediation and decommissioning options should be provided. The removal of turbines and access tracks prior to decommissioning should be considered as a reasonable alternative to ameliorate any adverse effects generated by the development.
2.4	Are the main reasons for choice of the proposed Project explained, including any environmental reasons for the choice?	Yes	Yes	
2.5	Are the main environmental effects of the alternatives compared with those of the proposed Project?	Yes	Yes	

SECTION 3	DESCRIPTION OF ENVIRONMENT LIKELY TO BE AFFECTED BY THEPROJECT			
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
Aspects of the Environment				
3.1	Are the existing land uses of the land to be occupied by the Project and the surrounding area described and are any people living on or using the land identified? (including residential, commercial, industrial, agricultural, recreational and amenity land uses and any buildings, structures or other property)	Yes	No	Sufficient information / description of communities within the surrounding area not provided; recreation and amenity not adequately discussed; agricultural uses not identified.
3.2	Are the topography, geology and soils of the land to be occupied by the Project and the surrounding area described?	Yes	Yes	
3.3	Are any significant features of the topography or geology of the area described and are the conditions and use of soils described? (including soil quality stability and erosion, agricultural use and agricultural land quality)	Yes	No	Mapping is required of forestry plough lines, fissures along these ploughing furrows caused by peat shrinkage, and presence of other signs of peat deformation (such as sub-surface peat pipes).
3.4	Are the fauna and flora and habitats of the land to be occupied by the Project and the surrounding area described and illustrated on appropriate maps?	Yes	Yes	
3.5	Are species populations and characteristics of habitats that may be affected by the Project described and are any designated or protected species or areas defined?	Yes	Yes	
3.6	Is the water environment of the area described? (including running and static surface waters, groundwaters, estuaries, coastal waters and the sea and including run off and drainage. NB not relevant if water environment will not be affected by the Project)	Yes	Yes	
3.7	Are the hydrology, water quality and use of any water resources that may be affected bythe Project described? (including use for water supply, fisheries, angling, bathing, amenity, navigation, effluent disposal)	Yes	Yes	
3.8	Are local climatic and meteorological conditions and existing air quality in the area described? (NB not relevant if the atmospheric environment will not be	Yes	Yes	

	affected by the project)			
3.9	Is the existing noise climate described? (NB not relevant if acoustic environment will not be affected by the Project)	Yes	Yes	
3.10	Is the existing situation regarding light, heat and electromagnetic radiation described? (NB not relevant if these characteristics of the environment will not be affected by the Project)	Yes	Yes	
3.11	Are any material assets in the area that may be affected by the Project described? (including buildings, other structures, *mineral resources, water resources)*	Yes	Yes	
3.12	Are any locations or features of archaeological, historic, architectural or othercommunity or cultural importance in the area that may be bisected the Project described, including any designated or protected sites?	Yes	No	Consideration of the archaeological potential of peat deposits should be provided.
3.13	Is the landscape or townscape of the area thatmay be affected by the Project described, including any designated or protected landscapes and any important views or viewpoints?	Yes	No	All the viewpoints are from roads so only cover transient views. There are no viewpoints from public footpaths so amenity views are not captured.

SECTION 3 DESCRIPTION OF ENVIRONMENT LIKELY TO BE AFFECTED BY THEPROJECT				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
3.14	Are demographic, social and socio-economic conditions (e.g. employment) in the area described?	Yes	No	Basic demographic information (population numbers) provided, but no further context added.
3.15	*Are any future changes in any of the above* aspects of the environment, that may occur in the absence of the project, described? (the so-called Moving Baseline or No Project situation)	*No*	*N/A*	
Data Collection and Survey Methods				
3.16	Has the study area been defined widely enough to include all the area likely to be significantly affected by the Project?	Yes	Yes	
3.17	Have all relevant national and local agencies been contacted to collect information on the baseline environment?	Yes	No	No details are included with regard to stakeholder engagement are provided. If any engagement was undertaken this should be provided.
3.18	Have sources of data and information on the existing environment been adequately referenced?	Yes	No	Much relevant information contained within Lindsay & Bragg (2005) is not referred to, and should now be addressed.
3.19	Where surveys have been undertaken as part of the Environmental Studies to characterise the baseline environment are the methods used, any difficulties encountered and any uncertainties in the data described?	Yes	No	Extensive use of shear vane testing forms a key part of the slope stability assessment. There is much discussion within the relevant scientific literature about the debatable value of shear vane testing in peat, and the guidance claimed to be used by the rEIAR is very specific about these uncertainties. The rEIAR should include a meaningful discussion about the uncertainties involved in shear vane testing for peat soils.
3.20	Were the methods used appropriate for the purpose?	Yes	No	Notwithstanding the uncertainties associated with the use of shear vane testing in peat, the majority of results for the site were obtained using one of the smallest available shear vane devices – a device which can in any case only probe to a depth of 3 m – whereas specialist guidance recommends use of the largest vane size possible because large vane sizes are thought to reduce (but not eliminate) the errors. Re-survey of the site should be undertaken using a large-vaned (200+ mm)

				capable of testing to the full depth of the deepest peat.
3.21	Are any important gaps in the data on the existing environment identified and the *meansused to deal with these gaps during* the assessment explained?	Yes	No	The existing peat environment across the site as a whole has not been described because the site-wide field data were obtained some 15 years ago and the rEIAR states repeatedly that conditions have changed since then. New site-wide peat soil and hydrological data are required to substantiate this assertion. Limited instrumental monitoring was decommissioned in 2014. A site-wide set of instrumentation should be installed to provide ongoing evidence of site condition and stability.
3.22	If surveys would be required to adequately characterise the baseline environment but they have not been practicable for any reason, are the reasons explained and proposals set out for the surveys to be undertaken at a later stage?	Yes	Yes	

SECTION 4 DESCRIPTION OF THE LIKELY SIGNFICANT EFFECTS OF THE PROJECT				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
Scoping of Effects				
4.1	Is the process by which the scope of the Environmental Studies was defined described? (for assistance, see the Scoping Guide in this series)	Yes	No	There is no evidence of engagement with stakeholders to define and agree the scope of works, but best practice guidance has been followed.
4.2	Is it evident that a systematic approach to scoping was adopted?	Yes	No	There is no evidence of engagement with stakeholders to define and agree the scope of works.
4.3	Is it evident that full consultation was carried out during scoping?	Yes	No	There is no evidence of engagement with stakeholders to define and agree the scope of works.
4.4	Are the comments and views of consultees presented?	Yes	No	There is no evidence of engagement with stakeholders to define and agree the scope of works.
Prediction of Direct Effects				
4.5	Are direct, primary effects on land uses, people and property described and where appropriate quantified?	Yes	No	Direct, primary effects on land uses including farmland and turbary have not been properly described or quantified. Effects on people have not been described in sufficient detail, for example there is no detailed description of individual communities and populations to enable a robust assessment of these areas to take place.
4.6	Are direct, primary effects on geological features and characteristics of soils described and where appropriate quantified?	Yes	No	The effect of drainage for the windfarm infrastructure is discussed only in terms of increased strength or the peat resulting from actively managed drainage but there is no recognitions that such drainage also causes long-term shrinkage and cracking of peat soils, reducing the overall stability of the peat, particularly under projected climate conditions of long dry spells and intense rainfall. The peat slide risk assessment should be repeated using new field data for the condition of the peat soil and its hydrology across the site.
4.7	Are direct, primary effects on fauna and flora and habitats described and where appropriatequantified?	Yes	Yes	
4.8	Are direct, primary effects on the hydrology and water quality of water features described	Yes	No	Hydrology and peat soils are intimately related. See comment under 4.6.

	and where appropriate quantified?			
4.9	Are direct, primary effects on uses of the water environment described and where appropriate quantified?	Yes	Yes	
4.10	Are direct, primary effects on air quality and climatic conditions described and where appropriate quantified?	Yes	No	Individual component input values to the Scottish Government Carbon Calculator are not presented, so although collective values are quantified it is impossible to validate these. Individual input values to the Carbon Calculator should be presented and explained.
4.11	Are direct, primary effects on the acoustic environment (noise or vibration) described and where appropriate quantified?	Yes	Yes	
4.12	Are direct, primary effects on heat, light or electromagnetic radiation described and where appropriate quantified?	Yes	Yes	
4.13	Are direct, primary effects on material assets and depletion of non-renewable natural resources (e.g. fossil fuels, minerals) described?	Yes	No	A Material Resources Chapter should be provided to set out the project's impact on the depletion of natural resources.
4.14	Are direct, primary effects on locations or features of cultural importance described?	Yes	Yes	
4.15	Are direct, primary effects on the quality of thelandscape and on views and viewpoints described and where appropriate illustrated?	Yes	Yes	
4.16	Are direct, primary effects on demography,social and socio-economic condition in the area described and where appropriate quantified?	Yes	No	Impacts of the project on recreational activities and amenity in the vicinity of the project are not considered to be adequately dealt with.
Prediction of Secondary, Temporary, Short Term, Permanent, Long Term, Accidental, Indirect, CumulativeEffects				

SECTION 4 DESCRIPTION OF THE LIKELY SIGNFICANT EFFECTS OF THE PROJECT				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
4.17	Are secondary effects on any of the above aspects of the environment caused by primary effects on other aspects described and where appropriate quantified? (e.g. effects on fauna, flora orhabitats caused by soil, air or water pollution or noise; effectson uses of water caused by changes in hydrology or water quality; effects on archaeological remains caused by desiccation of soils)	Yes	Yes	
4.18	Are temporary, short term effects caused during construction or during time limitedphases of project operation or decommissioning described?	Yes	Yes	
4.19	Are permanent effects on the environment caused by construction, operation or decommissioning of the Project described?	Yes	No	An explanation is required of the ecological and hydrological implications of leaving the roads, turbine bases and peat repository sites in place on decommissioning.
4.20	Are long term effects on the environment caused over the lifetime of Project operations or caused by build up of pollutants in the environment described?	Yes	No	Despite emphasising the importance for peat-slope stability of maintaining an efficient drainage system and prevention of water ponding during the life of the windfarm, the rEIAR proposes that the drainage system be allowed to choke up naturally (and therefore pond water) after decommissioning. The implications of this for subsequent peat slope stability should be evaluated and quantified.
4.21	Are effects which could result from accidents, abnormal events or exposure of the Project to natural or man-made disasters described and where appropriate quantified?	Yes	No	The effect of site drainage and consequent shrinkage and cracking of the peat is to make the peat mantle more prone to slope failure in the event that climate change results in longer dry spells followed by intense rainfall associated with convective storms. The implications of such a scenario should be evaluated.
4.22	Are effects on the environment caused by activities ancillary to the main project described? (ancillary activities are part of the project but usually take place distant from the main Project location e.g. construction of access routes and infrastructure, traffic movements, sourcing of aggregates or other raw materials,	Yes	No	Whilst offsite traffic movements are forecast, the magnitude of impacts and sensitivity of the existing environment are not defined. The significance of traffic and transport effects is therefore not adequately assessed.

	generation and supply of power, disposal of effluents or wastes			
4.23	Are indirect effects on the environment *caused by consequential development* described? (consequential development is other projects, not part of the main Project, stimulated to take place by implementation of the Project e.g. to provide new goods or services needed for the Project, to house new populations or businesses stimulated by the Project)	No	N/A	
4.24	*Are cumulative effects on the environment* off the Project together with other existing or planned developments in the locality described? (different future scenarios including a worst case scenario should be described). For further guidance on assessment of cumulative impacts see http://europa.eu.int/comm/environment/eia/eia-support	*Yes*	*No*	*An assessment of the cumulative tree* felling at the site and in the surrounding area should be undertaken.
4.25	Are the geographic extent, duration, frequency, reversibility and probability of occurrence of each effect identified as appropriate?	Yes	No	In relation to peat slide risk, various 'likelihood' values are presented but the derivation of these values either does not follow the method recommended by the adopted guidance, or in the case of the key assessments presented, are not explained at all. A revised 'likelihood' assessment should be presented based on up-to-date field data.
Prediction of Effects on Human Health and Sustainable Development Issues				
4.26	Are primary and secondary effects on human health and welfare described and where appropriate quantified? (e.g. health effects caused by release of toxic substances to the environment, health risks *arising from major hazards associated with* the Project, effects caused by changes in disease vectors caused by the project, changes in living conditions, effects on vulnerable groups)	Yes	No	The peat slide risk assessment for the main site is not based on relevant (i.e. recent) data and key steps are not explained, but suggest that there is no risk to human health and welfare. Consequently the possible scale of peat slide risk to human health and welfare is not discussed. Once a revised peat slide risk assessment has been generated, the potential for risk to human health and welfare should be revisited.
4.27	Are impacts on issues such as biodiversity, global climate change and sustainable development discussed where appropriate?	Yes	Yes	
Evaluation of the Significance of Effects				

SECTION 4 DESCRIPTION OF THE LIKELY SIGNFICANT EFFECTS OF THE PROJECT				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
4.28	Is the significance or importance of each predicted effect discussed in terms of its compliance with legal requirement and the number, importance and sensitivity of people, resources or other receptors affected?	Yes	No	Lindsay & Bragg (2005) point to the use of avalanche corridor mapping, as used in alpine regions to generate maps of potential impact should peat slope failure occur down the many potential avenues highlighted by Lindsay & Bragg (2005). This approach should be employed to highlight potential areas of impact.
4.29	Where effects are evaluated against legal standards or requirements are appropriate local, national or international standards used and relevant guidance followed?	Yes	Yes	
4.30	Are positive effects on the environment *described as well as negative effects?*	Yes	Yes	
4.31	Is the significance of each effect clearly explained?	Yes	No	The assessment would benefit from tabulating receptors, their attributes, value assigned and rationale for this.
Impact Assessment Methods				
4.32	Are methods used to predict effects described and are the reasons for their choice, any difficulties encountered and uncertainties in the results discussed?	Yes	Yes	
4.33	Where there is uncertainty about the precise details of the Project and its impact on the environment are worst case predictions described?	Yes	Yes	
4.34	Where there have been difficulties in compiling the data needed to predict or *evaluate effects are these difficulties* acknowledged and their implications for the results discussed?	Yes	Yes	
4.35	Is the basis for evaluating the significance or importance of impacts clearly described?	Yes	Yes	
4.36	Are impacts described on the basis that all proposed mitigation has been implemented i.e. are residual impacts described?	Yes	Yes	
4.37	Is the level of treatment of each effect appropriate to its importance for the development consent decision? Does the discussion focus on the key issues and avoid irrelevant or unnecessary information?	Yes	No	The assessment of effects is lengthy, and all degrees of effect are described in the same detail. The assessment could be reported in a more focused and concise way.

4.38	Is appropriate emphasis given to the most severe, adverse effects of the Project with lesser emphasis given to less significant effects	Yes	No	See above comment

SECTION 5 DESCRIPTION OF MITIGATION				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
5.1	Where there are significant adverse effects on any aspect of the environment is the potential for mitigation of these effects discussed?	Yes	Yes	
5.2	Are any measures which the developer *proposes to implement to mitigate effects* clearly described and their effect on the magnitude and significance of impacts clearly explained?	Yes	No	Residual effects following the *implementation are set out but the* effect of mitigation measures on magnitude and significance of impacts is not clear.
5.3	If the effect of mitigation measures on the magnitude and significance of impacts is uncertain is this explained?	Yes	No	
5.4	Is it clear whether the Developer has made a binding commitment to implement the proposed mitigation or that the mitigation measures are just suggestions or recommendations?	Yes	No	No details of securing mechanisms for the proposed mitigation measures are included
5.5	Are the Developer's reasons for choosing the proposed mitigation explained?	Yes	Yes	
5.6	Are responsibilities for implementation of mitigation including funding clearly defined?	Yes	No	No details of these aspects are provided
5.7	Where *mitigation of significant adverse* effects is not practicable or the developer has chosen not to propose any mitigation are the reasons for this clearly explained?	Yes	N/A	
5.8	Is it evident that the EIA Team and the Developer have considered the full range of possible approaches to mitigation including measures to reduce or avoid *impacts by alternative strategies or* locations, changes to the project design and layout, changes to methods and processes, "end of pipe" treatment, changes to implementation plans and management practices, measures to repair or remedy impacts and measures to compensate impacts?	Yes	No	Although removal of turbines is not considered as a mitigation measure. There is also no plan for experimental testing of options to establish peat slope stability through restoration of a peat-forming habitat as the final stage of decommissioning. Such a programme is required to ensure long-term stability of the peat mantle across the site.
5.9	Are arrangements proposed to monitor and manage residual impacts?	Yes	No	
5.10	Are any negative effects of the proposed mitigation described?	Yes	No	

SECTION 6 NON TECHNICAL SUMMARY				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
6.1	Does the Environmental information include a Non-Technical Summary?	Yes	Yes	
6.2	Does the Summary provide a concise but comprehensive description of the Project, its environment, the effects of the Project on the environment and the proposed mitigation?	Yes	Yes	
6.3	Does the Summary highlight any significant uncertainties about the Project and its environmental effects?	Yes	Yes	The summary should highlight the uncertainties surrounding the assessment – particularly with regard to the retrospective nature of the assessment.
6.4	Does the Summary explain the development consent process for the Project and the role ofEIA in this process?	Yes	Yes	
6.5	Does the Summary provide an overview of the approach to the assessment?	Yes	Yes	
6.6	Is the Summary written in non-technical language, avoiding technical terms, detailed data and scientific discussion?	Yes	Yes	
6.7	Would it be comprehensible to a lay member of the public?	Yes	No	The documents are too long and contain large volumes of contextual information that draw focus away from the assessment.

SECTION 7 QUALITY OF PRESENTATION				
No.	**Review Question**	**Relevant?**	**Adequately Addressed?**	**What further information is needed?**
7.1	Is the Environmental Information available in one or more clearly defined documents?	Yes	Yes	
7.2	Is the document(s) logically organised and clearly structured so that the reader can locate information easily?	Yes	No	Appendices are poorly labelled and it is not possible to identify their content without opening.
7.3	Is there a table of contents at the beginning of the document(s)	Yes	Yes	
7.4	Is there a clear description of the process which has been followed?	Yes	Yes	
7.5	Is the presentation comprehensive but concise, avoiding irrelevant data and information?	Yes	No	The reports include large volumes of information that make it difficult to follow the assessment.
7.6	*Does the presentation make effective use of* tables, figures, maps, photographs and other graphics?	*Yes*	*Yes*	
7.7	Does the presentation make effective use of annexes or appendices to present detailed data not essential to understanding the main text?	Yes	No	
7.8	Are all analyses and conclusions adequately *supported with data and evidence?*	Yes	No	
7.9	Are all sources of data properly referenced?	Yes	Yes	
7.10	Is consistent terminology used throughout the document(s)?	Yes	Yes	
7.11	Does it read as a single document with cross referencing between sections used to help the reader navigate through the document(s)?	Yes	Yes	
7.12	Is the presentation demonstrably fair and as far as possible impartial and objective?	Yes	No	

APPENDIX B

List of Complaints

Complainant	Summary of Complaint	Date Received
European Environmental Bureau	Substitute Consent Provisions	11 December 2020
South Galway Flood Relief Committee – David Murray	Flooding – lack of consultation and inaccuracies in the assessment	26 October 2020
National Parks and Wildlife – Patrick White	Siltation impact on qualifying features of European Designation Sites	11 March 1998
Duchas Heritage Service – Joanna Modzelewska	Lack of consideration of Protected Bird Species	20 September 2001
Martin Collins	No public participation and non-compliant rEIAR	12 October 2020
Martin Collins	Inadequate public consultation process	10 December 2020
Martin Collins	Infringement of turbary rights	26 April 2020
Peter Crossan	Unlawful consenting process	18 December 2020

List of Reviewed Derrybrien Wind Farm Project Documents

Document
Cover Letter
Application form
EIA portal confirmation notice
Site notice as erected on site at various locations on 21st August 2020
Newspaper notice as published in the Irish Independent and Connacht Tribune
Planning Report
Plans and Drawings
Remedial Environmental Impact Assessment Report
Remedial Natura Impact Statement

APPENDIX C

Geology and Soils – Supplementary Critique

Appendix C: Chapter 10. Geology, Soils and Land

1. Issues of Administration, Submission and Omission

The main rEIAS document, namely Chapter 10 – Soils, Geology and Land, Document No.: QS-000280-01-R460-001-000, submitted by ESB is essentially a synthesis of data and procedures rather than a presentation of the core factual information. The details of actual procedures, key data and decision-steps are largely contained in an Appendix titled Chapter 10 – Soils, Geology and Land Appendices, Document No.: QS-000280-01-R460-001-000.

The rEIAS document provides a list of contents for the document itself, but provides no information in the Contents pages about what is contained within the Appendices (see attached Figure).

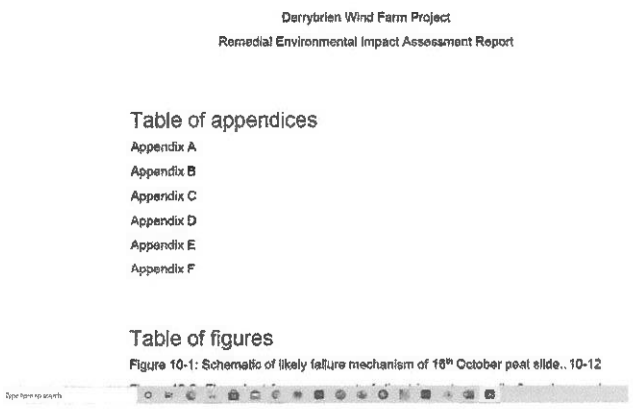
Derrybrien Wind Farm Project
Remedial Environmental Impact Assessment Report

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Figure 10-1: Schematic of likely failure mechanism of 18th October peat slide.. 10-12

Figure 1: Contents of Appendices as listed in the Chapter 10 Main Chapter

This provided list of Appendices suggests that there are six Appendices, A – F, but what these contain and what their significance might be is left to the reader to guess. Turning to the Appendix document itself (namely Chapter 10 – Soils, Geology and Land Appendices, Document No.: QS-000280-01-R460-001-000), this provides no Contents page or Index at all, other than the contents pages of the individual reports presented within the appendices – to which there is no guide at the start of the document. Furthermore, it emerges that there are not six Appendices but instead a nested multitude of Appendices, in some cases going down as far as four levels of Appendix.

Lacking any sort of Contents page, this 2640-page document would be considered by many to be not fit for purpose, particularly as much crucial information is provided only within the Appendices document rather than in the rEIAS itself. As such, this raises questions about whether the rEIAS is itself fit for purpose.

2. Official rEIAS Guidance documents – the context

2.1 Legal requirements and available guidance

The legal basis of the requirement for an EIA in this case is Council Directive 85/337/EEC, in which Article 5 states that the following information must, as a minimum, be supplied with respect to the development proposal:

- a description of the project comprising information on the site, design and size of the project;
- a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects;
- the data required to identify and assess the main effects which the project is likely to have on the environment;
- a non-technical summary of the information mentioned in indents 1 to 3 .

Guidance for projects required to undertake such an EIA is provided in the form of:

- European Commission (2017) *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)*, and
- European Commission (1999) *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.*

While these guidance documents provide much valuable information about setting out what should be included within an EIA, this information is necessarily generic because it is designed to cover all forms of potential development. Consequently, while the topic headings and principles are valuable guides for any form of development there is nothing specific to windfarm development on peat. The onus is on the developer to ensure that the an EIA is conducted in such a way that the findings will meet the required generic requirements. In order to meet such requirements it is evident that the developer must make use of the best available guidance specific to windfarm development on peat covered landscapes.

The rEIAS investigations into geology, soils and land are thus best viewed within the context of rEIAR's own professed intent to follow the best available official guidance. The precise nature of the guidance followed for various stages in the assessment, however, is not always entirely clear because the work is variously described as having been undertaken in accordance with two (or more) different documents. The two main documents referred to are:

- **Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects, published by the Scottish Government Energy Consent Unit (2nd Edition, April 2017)**; and
- ***EPA 2017 Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.***

No specific reference is made in the rEIAR to the 1999 and 2017 EU guidance documents, though the EPA 2017 Draft Guidelines refer extensively to the requirements set out in the Directive itself, as amended.

Given the complexity of the rEIAS and its accompanying Appendix document, specific reference to particular parts of these documents will be indicated thus: '*Example*'

2.2 Documents referred to as the basis for the rEIAS assessment of Geology, Soils and Land

'*Section 10.1.2.2*' states that the probability of peat failure has been assessed "*...in accordance with current best practice guidelines for peat landslide hazard and risk assessments for wind farm developments on upland blanket bogs (e.g.* ***Scottish Government – Energy Consent Unit, 2017****)."*

'*Section 10.1.2.2*' goes on to state that the impact assessment "*...has necessarily been carried out in accordance with the current* ***EPA Guidelines (EPA, 2017)*** *as well as current best practice guidelines for peat landslide hazard and risk assessments for wind farm developments on upland blanket bogs (****Scottish Government – Energy Consent Unit, 2017****)*".

'*Section 10.1.2.2*' also observes that the Scottish Government guidance was "*...first referenced for assessing the impact of wind farms on peat soils in the 2008 version of the* ***Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2008)***" but it is not made clear whether the current rEIAR assessment used these Irish Wind Energy Industry guidelines.

'*Section 10.1.5*' then states that the methodology used "to assess the impact of the various project activities on the receiving soils, geology and land on the site is based on the recommendations in **Section 3.7 of the 2017 Draft EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2017)**".

It also notes, under Probability of Occurrence (Peat Failure) that the assessment is "consistent with the **EPA Guidelines (EPA, 2017)** as well as current best practice guidelines for peat landslide hazard and risk assessments in **Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects, 2nd Edition, April 2017 (Scottish Government – Energy Consent Unit, 2017)**."

'*Section 10.2.4*' states that "...peat stability assessments *have been carried out in accordance with the best practice guidelines given in "****Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects, published by the Scottish Government Energy Consent Unit (2nd Edition, April 2017)****".*

'Section 10.2.4.1' states that the Peat Slide Risk Assessment (PSRA) "*...has been carried out in accordance with the current best practice guidelines for peat landslide risk assessments for wind farms on upland blanket bogs* ***(Scottish Government, Energy Consent Unit, 2017)***".

'Section 10.2.4.3' states that the stability risk assessment for the Peat Slide-Source Area was undertaken "*...in accordance with the best practice guidelines*" and then cites the **Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects, published by the Scottish Government Energy Consent Unit (2nd Edition, April 2017).**

'Section 10.3.2.1.1.3' states that the probability of peat failure associated with the Construction Phase (2003-2006) has been assessed in a way that is "*...consistent with the* ***EPA Guidelines (2017)*** *as well as current best practice guidelines for peat stability risk assessments* ***(Scottish Government, Energy Consent Unit, 2017)***".

'Section 10.3.2.1.1.3.1' considers those effects of the 2003 peat slide on the receiving soils, geology and land that were considered 'Significant', and notes that the compounding factors identified by AGEC (2003) "*...would indicate that the peat on the slope in this area could have been at or close to the point of failure when the construction works were being carried out. This is consistent with the current best practice guidelines for assessing the risk of peat instability for wind farm developments on upland blanket bogs* ***(Scottish Government – Energy Consent Unit, 2017)***".

'Section 10.7: Conclusions' – states "*The assessment has been carried out in accordance with the 2017* ***EPA Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.***"

2.3 Content and quality of referenced guidance documents

Accepting that these various documents have acted as the framework shaping the nature and content of the rEIAR, it is instructive to examine the quality and content of these referenced documents themselves within the context of the subject-specific issues relevant to the rEIAR.

Considering firstly the oldest of the documents referred to – namely the ***Best Practice Guidelines for the Irish Wind Energy Industry (IWEA, 2008, updated 2012)*** – this itself refers to an even earlier document: **Geology in Environmental Impact Statements – A Guide" (2002)** published by the Institute of Geologists of Ireland. The latter older document does not specifically identify windfarm construction on peat as an activity but it sets out a general framework for geological investigation, consisting of:

- The use of regional geology maps.

- A site investigation to include the appropriate use of mapping, sampling, trenching/pitting, drilling, geophysics, geotechnical appraisal of soil and rock properties and laboratory analysis of soil, rock and water samples.
- The preparation of a geological report including appropriate maps and sections.

The **2012 IWEA Guidelines** then identify a longer list of factors to consider for *windfarm projects on peat but provide no further detail (in fact less detail) than that* offered by the IGI guidance:

- impacts on ground stability;
- contamination of the soil by leakages or spillages;
- compaction of the soil and removal of the soils from site;
- the removal of surficial/bedrock deposits and stability of same;
- impact of construction activities on peatlands;
- impact on groundwater levels and abstraction potential and pollution of same;
- impact on geological heritage sites (CGS or NHA) identified by GSI.

The IWEA Guidelines also provide a flowchart (as an Appendix F) designed to guide decision-making in relation to the assessment of peat stability. The flowchart consists almost entirely of decision-making processes with just two boxes that *address actual assessment processes, described as:*

- Carry out Peat Stability Assessment; Produce Hazard Zone Plan;
- Carry out detailed site investigations where development impinges on peat-covered areas.

The practical guidance for site investigation is thus far based solely on the older, general guidance produced by IGI, which advises the developer to assess potential *geology and soil impacts, and specifically peat stability, through the use of:*

- mapping;
- sampling;
- trench/pitting;
- drilling;
- geophysics;
- *geotechnical appraisal;*
- laboratory analysis.

The later 2012 IWEA Guidelines provide no further detail about what type of sampling or geotechnical appraisal should be undertaken, nor how the results should be assessed.

The **EPA Draft Guidelines (2017) on the Information to be Contained in Environmental Impact Assessment Reports** represent the latest guidance provided to developers in Ireland, transposing the requirements of **EU Directive 2011/92/EU** and indicating subsequent changes required by the amending **EU Directive 2014/52/EU.** These Guidelines, however, contain no specific guidance about developments on peat soils. The guidance consists entirely of generic decision-making processes. Developers are given no guidance about what specifically should be assessed in relation to windfarm developments on peat. There is no reference even to the first edition of the **Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects,** published by the Scottish Government Energy Consent Unit and in its revised edition acknowledged in the rEIAS as the best available guidance for peatslide risk assessment.

When the rEIAS therefore states that its reporting is consistent with the *requirements of the* ***EPA Draft Guidelines (2017) on the Information to be Contained in Environmental Impact Assessment Reports*** what it means is that the recommended decision-making steps have been taken but this does not indicate that the decisions are based on appropriate testing or data. It would appear that the only source of subject-specific guidance for actual testing referred to (albeit indirectly) by the rEIAS and provided by the Irish authorities is the list of factors to measure originally set out in the **Geology in Environmental Impact Statements – A Guide"** *published in 2002 by the Institute of Geologists of Ireland.*

On the other hand, the rEIAS does state repeatedly that its testing and assessments are also based on the **Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Projects, published by the Scottish Government Energy Consent Unit (2nd Edition, April 2017)** – hereafter referred to as **SGG-2017**. This document does set out a detailed set of procedures for the testing of peat-covered landscapes subject to proposals for windfarm development.

2.4 Supplementary supporting reference material

Supplementing the SGG-2017 guidelines is a body of specialist literature which explores in considerable depth the current state of knowledge about peatslide events, what predisposes any given piece of ground to slope failure, and what factors may trigger such failure. Dykes (2008) summarises succinctly and effectively the factors which are now recognised as pre-disposing peat ground to instability as well as the factors associated with triggering instability. The list is not long. It is expressed with such clarity that the issues should be clear to the general reader. The key factors identified by Dykes (2008) are:

- Heavy rainfall being the trigger for the majority of peat landslides;
- Changing climate, giving drier summers and more intense rainfall events combine with cracking of the peat surface due to drying of the peat to generate various adverse hydrological effects;

- Land drains and boundary ditches acting to focus water runoff;
- Reduced lateral support caused by land drains and boundary ditches cutting through the peat matrix;
- Disruption of natural mechanical and hydrological continuity by a range of forestry activities;
- Loading of peat by 'floating' roads across the peat;
- Loading of peat by placement of excavated spoil on the peat.

Additional specialist literature includes O'Kelly (2017), Long, Jennings and Carroll (2011), Boylan, Jennings and Long (2008), Dykes (2008), Dykes and Warburton (2008), Dykes and Warburton (2007a,b), Dykes and Kirk (2006), Long and Jennings (2006), Yang and Dykes (2006), Creighton (2006), Long (2005), Warburton, Holden and Mills (2004), Lindsay and Bragg (2005).

While much of this body of knowledge is incorporated into SGG-2017, there are *some issues where SGG-2017 acknowledges ongoing scientific uncertainty with* respect to certain aspects of peatland properties. SGG-2017 therefore makes clear that an awareness of the available body of relevant literature should still shape actions in terms of data collection as well as informing subsequent decision-making.

In terms of the detailed site- and subject-specific objectives which the rEIAS sets for itself, it would therefore seem that these should be formally measured against the details set out in SGG-2017, particularly as this guidance fits seamlessly into the *requirements set out in the Council Directive (as amended) and the guidance* provided by the European Commission. This is particularly the case given the Irish authorities do not appear to have provided any detailed guidance for this topic. Given the centrality of SGG-2017 guidance to the work of the rEIAS, it is therefore worth using this guidance to evaluate and compare the data types, the data-gathering methods and the risk assessment procedures presented within the rEAIS.

3. Context of SGG-2017 and Derrybrien sequence of events

It is important to acknowledge that the original pre-construction EIS, as well as the start of construction, the major peatslide, the immediate post-peatslide responses and then final completion of construction, all pre-date publication of the SGG-2017 guidance. As such, close adherence to that particular guidance cannot necessarily be expected from those pre-2017 activities although it is reasonable to expect that *these activities would be informed by specialist literature available at the time.*

It is also necessary to point out that most of the immediate post-slide actions pre-dated publication of, and issues highlighted by, Lindsay & Bragg (2005) whose report underpinned subsequent rulings by the Irish High Court and by the Court of Justice of the European Communities.

Actions and data collection undertaken between 2005 and 2017 have, however, been undertaken in the knowledge of issues raised by Lindsay & Bragg (2005), as well as issues raised by AGEC (2004, 2005). It is also important to note that the first edition of the Scottish guidance was published in 2006.

The submitted rEIAS and the risk assessments it presents, however, post-date all of this published information and guidance. While the field data on which the rEIAS is *based comes from 2005 or earlier (a point that will be explored in more detail later)*, the procedures for peatslide risk assessment should have been made in the full knowledge of all the preceding information and guidance, and in particular the guidance provided by SGG-2017. Indeed, this is the stated approach of the rEIAS.

The sections below therefore follow the structure and headings of the SGG-2017 guidance.

4. Controls of peat instability - Overview

4.1 SGG-2017

The Scottish guidance begins with a context-setting review of peat landslides and the factors recognised as having a bearing on their likelihood. It categorises these factors under four main headings - preconditions, preparatory factors, pre-failure indicators and triggering factors.

4.1.1 Preconditions

These are described as 'static' or 'inherited' factors having the property of rendering any peat-covered slope more prone to slope failure, and, to a certain extent, generally being factors that cannot readily be altered and so must be allowed for:

- A peat layer overlying an impermeable mineral base (for example an iron pan);
- A convex slope or a slope with a break of slope;
- Proximity to zones of local drainage;
- Connectivity between surface drainage and sub-surface drainage, particularly connectivity to the peat-mineral interface.

4.1.2 Preparatory factors

These are defined as factors which change over time (tens to hundreds of years). They must therefore be catered for within both the design and operation of the development as well as in the years after development:

- Peat accumulation leading to increased mass on a slope;
- Increased water content (and thus mass) sitting on a slope;

These two factors are inherent parts of peat formation and accumulation. Nevertheless, although conventional slope-failure analysis and Factor of Safety

formulations identify increased mass on a slope as a factor which increases the potential for slope failure, in practice peatland systems appear to have a number of self-regulatory processes which act to reduce this tendency, resulting in the very low occurrence of failure within natural, undisturbed peat systems.

The Scottish Guidance then identifies a set of Preparatory factors associated with human disturbance which, in contrast, have often been associated with slope failure *(e.g. Warburton et al., 2004; Dykes & Warburton, 2008; Dykes, 2008)*:

- Increased mass on a slope resulting from afforestation;
- Reduction in shear strength of peat or mineral base caused by cracking, chemical or physical weathering;
- Loss of surface vegetation and thus loss of associated tensile strength;
- Increased buoyancy through formation of sub-surface pools or water-filled pipe networks
- Increased buoyancy caused by wetting up of desiccated areas of peat (which becomes lighter and more buoyant when dried);
- Drying and cracking of the peat as a result of afforestation.

4.1.3 Pre-failure indicators

These indicators provide evidence that the site may be prone to slope failure based on identifiable features of features which should be investigated:

- Presence of historic and recent failure scars and debris;
- Presence of features indicative of tension;
- Presence of features indicative of compression;
- Evidence of 'peat creep';
- Presence of sub-surface drainage networks or water bodies;
- Presence of seeps and springs;
- Presence of artificial drains or cuts down to the substrate;
- Concentration of surface drainage networks;
- Presence of soft clay with organic staining at the peat and weathered bedrock interface; and
- Presence of an iron pan within the mineral substrate.

4.1.4 Triggering factors

Natural triggering factors commonly occurring in the UK are, of themselves, not necessarily or normally a threat to slope stability:

- Intense rainfall causing localised transient high pore-water pressures along potential rupture surfaces;
- Snow-melt causing similar effects.

Triggers associated with human activities include:

- Alteration of natural drainage pattern in such a way that drainage is focused to potential rupture surfaces (e.g. the peat-mineral interface);
- Ground accelerations caused by, for example, blasting, resulting in greater shear stress;
- Removal of the downslope 'toe' of a peat mass, reducing support to the peat upslope by, for example, construction of access tracks;
- Increased loading forces on the peat by, for example, heavy plant, structures or excavated arisings;
- Digging and tipping within the peat and sub-peat mineral base.

4.2 rEIAS - Controls of peat instability – Overview

The rEIAS does not specifically address at any point the list of preconditioning factors, preparatory factors, pre-failure indicators and triggering factors identified in the Scottish Government Guidance (2017) document. Most of these factors do appear in one form or another in one or more of the documents contained within the Appendix document but there is no direct use of these in setting the context of the rEIAS approach. It is reasonable to believe that these should have been considered as the framework for the rEIAS because, as with the SGG-2017, these factors inevitably set the context for all further work because these are what have been identified in the available literature as key contributors to peatslope stability. Instead, no formal framework for the rEIAS approach is presented within the introductory '*10.1.1 – Chapter Scope*', nor indeed at any later stage in the rEIAS.

The set of factors used by the rEIAS to set the context of Risk Assessment is found in '*Section 10.1.2.1*' where the rEIAS cites the conclusions of the AGEC (2004) report which recognises that a number of factors probably contributed to triggering the slide and influenced the scale of the slide. The factors listed by the rEIAS as *recognised by the AGEC survey of 2003 are:*

- Loading of the peat by floating roads;
- Presence of a natural drainage line;
- A zone of weaker peat within the drainage line;
- The fact that drainage works were being undertaken downslope from the head of the failure (which may have acted as the trigger, or contributed to triggering the slide); and
- Existing furrows within the afforested areas dissecting the peat.

The 2003 AGEC survey, however, also identifies that water pooled in the excavation associated with Turbine 68 may have been transmitted via sub-surface drainage systems to the base of the peat, leading to *"build-up of water pressure at the base of the peat reducing effective stresses"* and that evidence of previous instability may have played a factor (AGEC, 2004, p.5). These factors are not highlighted here in the rEIAS.

Even turning to '*Section 10.2.4 – Baseline Peat Stability Risk Assessment*', there is no review of site condition factors for the site, although SGG-2017 makes clear that these should underpin all peatslide risk assessment. The reader is referred to '*Appendix B*' which consists of numerous earlier reports and documents, the majority of which date from the period 2001-2005. Of the two AGL reports in '*Appendix B*' which are dated 2020 (and therefore post-date SGG-2017), the first provides a '*Geotechnical Characterisation of Baseline Site Conditions*'. This identifies some specific and some generalised factors which form the basis of the Risk Assessment, namely:

- Deposits of deep (3-6 m) and relatively deep (2-3m) weak peat (cu ≈ 4-5 kPa) with low infinite slope Factor of Safety (<1.0-1.3);
- Areas of intermediate slope angles of 3-5° in close proximity to a convex break in slope to slope angles >5°;
- *Zones that are in the broad valleys directly upslope from the rivers and* streams downslope from the site boundary;
- Zones of deep peat with poor drainage and ponded surface water at the head of a watercourse, or along the edges of the terraces on the north side of the site; and
- Areas adjacent to the previous slide that have similar site characteristics.

It is instructive to compare the lists given above with those set out in SGG-2017 as factors requiring consideration within a peatslide risk assessment but which are not specifically articulated as context for a risk assessment within the rEIAS documents described above. Although several of these factors feature in the data gathering process at various stages, their use within the actual risk assessments presented is, at best, obscure.

Preconditions

- Connectivity between surface drainage and sub-surface drainage, particularly connectivity to the peat-mineral interface.

Preparatory factors

- Increased mass on a slope resulting from afforestation;
- Reduction in shear strength of peat or mineral base caused by cracking, chemical or physical weathering;
- Loss of surface vegetation and associated tensile strength;
- Increased buoyancy through formation of sub-surface pools or water-filled pipe networks
- Increased buoyancy caused by wetting up of desiccated areas of peat (which becomes lighter and more buoyant when dried);
- Drying and cracking of the peat as a result of afforestation.

Triggering factors

- Climate change resulting in more violent storms with intense rainfall causing localised transient high pore-water pressures along potential rupture surfaces;
- Snow-melt causing similar effects.
- Alteration of natural drainage pattern in such a way that drainage is focused to potential rupture surfaces (e.g. the peat-mineral interface);
- Removal of the downslope 'toe' of a peat mass, reducing support to the peat upslope by, for example, construction of access tracks.

This is a substantial list of factors which do not feature in any clear or explicit way in the risk assessment processes set out in the rEIAS and its Appendices. The absence of such factors in risk-assessment thinking and framing perhaps explains a great deal of what then follows in the remainder of the rEIAS. It also highlights the first area in which the rEIAS departs from the SGG-2017 guidance.

5. ***Methodology – Detailed site assessment***

Following an initial scoping exercise to determine whether a peatslide risk assessment is required, the recommended approach of SGG-2017 to peat landslide hazard risk assessment (PLHRA) consists of:

- a desk study of available material;
- site reconnaissance;
- site mapping and probing;
- hazard and risk assessment; and
- reporting.

5.1 Desk study

The desk study involves assembling and collating as much information as possible relevant to the character of the site and the behaviour of peat within the conditions *found on the site.*

5.1.1 SGG-2017 – Desk study

5.1.1.1 Extent of site investigations

The guidance emphasises that the assessment should not be restricted to the footprint of the development but must instead embrace "*...any areas of the*

landscape that the development might impact on...", and that "*Typically, the study area will be determined by catchments and topography...*"

5.1.1.2 Review of existing information

The guidance emphasises that "*...any and all relevant information relating to the site...*" should be identified and assembled in order to inform decision-making both in terms of designing an appropriate programme of field survey and monitoring, but also in assessing risk once the necessary information has been gathered and analysed.

5.1.2 rEIAS – Desk study

5.1.2.1 Extent of site investigations

In '*Section 10.1.2.2*' it is stated that the peatslide which occurred in October 2003 has been taken as the worst case scenario for the project. '*Section 10.1.5*' then further states that "*...the possible **Extent** of a peat slide and the **Sensitivity of the receiving soils, geology and land** have been calibrated by the scale of the very large peat slide that occurred on 16th October2003, and by the land that was directly impacted by the slide....Therefore, it has reasonably been considered as the worst-case scenario in assessing stability impacts on this project.*"

This stated position does not reflect SGG-2017 guidance on determining the extent of area to be considered, nor can adopting only the area of the slide and the land directly impacted by the slide as the impact zone be justified on the basis that this is the 'worst-case scenario'. In terms of impact, material from the 2003 slide travelled 17 km to Lough Cutra causing substantial fish-kills and disruption to the water supply for the town of Gort.

While '*Chapter 10*' is focused on geology, soils and land, it is also the main vehicle for assessing the likelihood of peatslide risk and possible scale of impact. It cannot be the case, therefore that this chapter should define the extent of site investigations and assessment of impact solely on the basis of land potentially affected when it is clear from the 2003 peatslide (and other large slides which have occurred on windfarms in Ireland since) that the receiving area of impact for due assessment should include watercourses too. It should be noted that SGG-2017 makes no such distinction between geology, soils and aquatic environment when describing how the area of investigation and the receiving area of impact should be assessed.

Furthermore, the constrained approach adopted by Chapter 10 of the rEIAS does not meet the requirement set out in Para.109 of the Judgement of the Court (Second Chamber) 3 July 2008 of the Court of Justice of the European Communities, Case C-215/06, highlighting '*...the environmental sensitivity of*

the geographical area, which must be considered having regard, inter alia, to 'the absorption capacity of the natural environment', paying particular attention to mountain and forest areas.'

5.1.2.2 Review of existing information

There is a stark difference between the list of reference material cited by the SGG-2017 guidance (81 documents) and the reference material cited by the rEIAS (16 documents). Had the rEIAS reference list focused solely on papers directly linked to Derrybrien this small number might have been understandable, but only two of the 16 cited documents relate directly to Derrybrien (and one of these is mis-spelled). The remainder are more general references to peat and its properties. As such, the rEIAS appears to have shaped its content around a very limited information-base.

As an example, taking a single author cited in the rEIAS reference list, Dykes appears twice in the rEIAS references but five times in the SGG-2017 guidance, and since the 2003 peatslide alone he has published 19 papers relevant to the issues covered by the rEIAS. Dykes himself has identified 166 papers specific to peat failures or engineering on peat (but does not claim to have been comprehensive). Many of his papers highlight the challenges involved because of the relatively young and undeveloped science of peatland engineering compared with engineering in mineral soils – a point also highlighted in the SGG-2017 guidance.

Turning to the two references cited by the rEIAS which are relevant to Derrybrien itself, one has no direct link to the question of peatslope stability. Inis Environmental Services (2004) is instead concerned solely with the impact of the 2003 slide on the river ecology of the Owendalluleegh River and thus provides no information about the peat within the windfarm site.

In contrast, the second reference, Lindsay and Bragg (2005), explores in very considerable detail the background to the 2003 slide, the nature of the peatslide, the consequences of the slide, possible further areas of concern, and makes a number of recommendations about what further considerations should be given to a range of factors going forward into the future life (and afterlife) of the windfarm. The rEIAS, however, cites this report only with reference to the *additional* peatslide which occurred on Sonnach Old across the valley from the Derrybrien windfarm. It makes no use of the detail provided by Lindsay and Bragg (2005) about the Derrybrien windfarm development itself, despite the fact that this report was central to judgements by both the Irish High Court and the Court of Justice of the European Communities. A great many issues are highlighted by Lindsay and Bragg (2005) but none of these is acknowledged or addressed by the rEIAS.

The 18 reports contained within rEIAS Chapter 10 – Soils, Geology and Land Appendices, Document No.: QS-000280-01-R460-001-000, together cite 37 references which are new and are neither repeats from the main rEIAS report nor repeated in others of these 18 reports. Some 11 or 12 of the cited papers do address the challenges of testing and working with peat soils. Again, however, none of the reports refers to Lindsay and Brag (2005) nor the issues raised therein.

Also surprising is the fact that the rEIAS reference list does not include one the most extensive reviews of Irish landslides to date, which is Creighton (2006), *'Landslides in Ireland'* – a report of the Irish Landslide Working Group. This report examines Irish landslides as a whole, but provides extensive information about Irish peatslides, including the 2003 Derrybrien peatslide.

5.2 Reconnaissance – ground conditions assessment

A site reconnaissance survey is recommended by SGG-2017 as a means of confirming evidence provisionally identified during the desk study, to confirm the general condition of the site as a whole and identify any practical issues likely to be faced during the subsequent more detailed ground conditions assessment.

5.2.1 SGG-2017 – Site mapping

As the SGG-2017 guidance states, *"At its most basic, a geomorphological map [which is required] should show..."*:

- The position of major slope breaks;
- The position and alignment of major natural drainage features (e.g. peat gullies and streams);
- The location and extent of erosion complexes;
- Outlines of past peat landslides (including source areas and deposits), if visible;
- Location, extent and orientation of cracks, fissures, ridges and other pre-failure indicators.

Additionally:

- The position and alignment of artificial drains;
- Turbary;
- Forest stands.

In the case of Derrybrien, there are no erosion complexes but all other factors are relevant.

5.2.2 rEIAS – Site mapping

The rEIAS does not offer a **geomorphological map** of the type specified by SGG-2017, even "at its most basic", although a conventional geomorphological map is presented for the grid connection and then essentially repeated for the downstream landscape of the peatslide area ('*rEAIS, Figure 10-26 and Figure 10-32*'). The rEIAS provides various maps, including a map of slopes ('*rEIAS, Figure 10-6*') and a map of drainage features, both natural and artificial ('*Drawing 003 of Appendix A of Appendix B*', and '*rEIAS, Figure 10-16*').

There is, however, no map indicating past slope failures even though the AGEC (2004) report indicates evidence of relict failure on the site's northern slopes ('*Appendix A, Fig.3*'). The maps of slopes are merely presented as they emerge from the mapping analysis with no apparent attempt to zone areas in relation to slope convexity or critical breaks in slope. While presenting an impressive appearance of detailed analysis, the key step of interpreting these results into something meaningful for peatslide risk is either absent or so obscurely hidden within decision-making that it cannot be identified.

Nor is there a **map indicating location, extent and orientation of cracks, fissures, ridges or other pre-failure indicators**. That such cracks and fissures exist at Derrybrien is highlighted repeatedly by Lindsay & Bragg (2005), who emphasise that *cracks can be found extensively throughout the forested areas (see Figure 1).*

Such cracking is a well-known phenomenon of plantations on peat as a result of drying out and consequent peat shrinkage. The smooth faces of many peat blocks, as illustrated by Lindsay & Bragg (2005), show where the peat separated into long ribbons of peat along these cracks during the 2003 slide. Such smooth-faced ribbons contrast markedly with the jagged faces of blocks typical of many peatslides where *the peat has simply been torn apart.*

A key, indeed a critical, part of the Derrybrien rEIAS should therefore have been the mapping of all such cracks and fissure, but the rEIAS makes no mention of such cracking. As SGG-2017 observes: *"In preparing assessments of peat stability, developers should give afforested peatlands (which are often hydrologically disrupted and physically degraded) the same scrutiny as peatlands without forest, even if this may be more arduous in practice (due to concealment of the ground surface by tree cover and associated access difficulties)."*

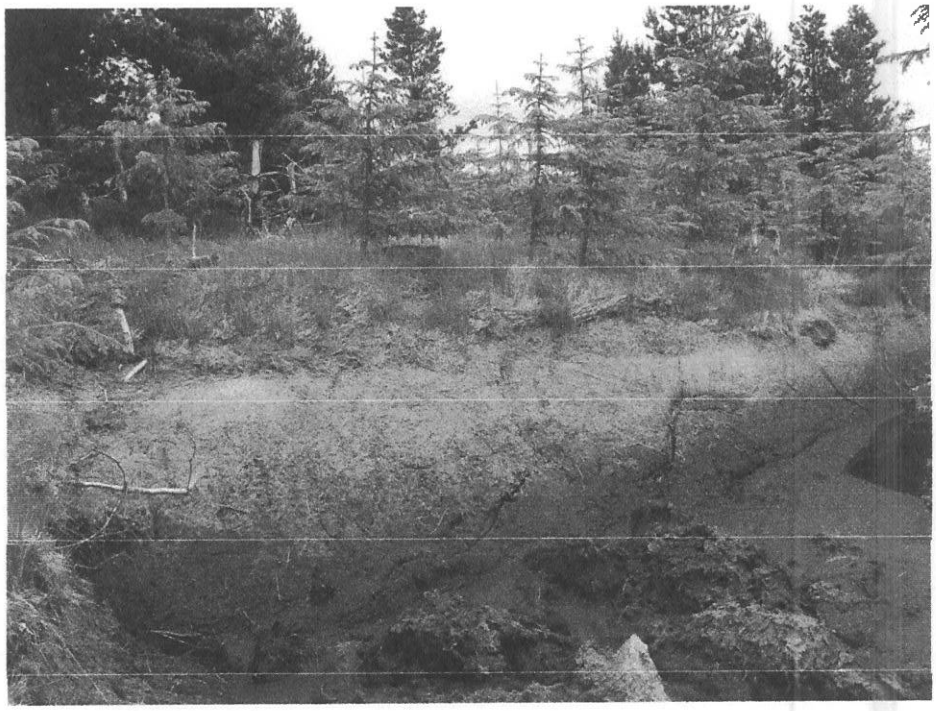

Figure 1. Smooth face of a peat crack, or fissure, resulting from peat shrinkage caused by water loss from the peat matrix as a result of drainage. The face is aligned along a former forestry ploughing furrow. Photograph taken during a 2004 field investigation of the Derrybrien windfarm site.

While the work undertaken between 2001 and 2005 evidently involved much arduous work in gathering data across the site, including within forested areas, there is not a single mention of mapping the cracks so clearly highlighted by Lindsay & Bragg (2005) within the forested areas. All references to cracks and fissures in the rEIAS relate to failures around turbines or roads, with no suggestion that cracks have developed or have been investigated elsewhere across the site.

Dykes (2008) summarises the risks poised by such regularly and intensively disrupted peat thus: "*...forestry operations necessarily disrupt the natural mechanical and hydrological continuity of the peat deposits through the pre-plantation ploughing and, in one known case so far, the loading of sloping blanket bog from a forestry road.*" In terms of assessing peatslide risk it is thus clear that careful mapping of such shrinkage features created within the forestry land must be a priority.

It might be claimed that the windfarm operators were not responsible for the forestry and its impacts. This may be offered as justification for only looking at cracks and similar failures directly associated with windfarm infrastructure. However, by taking on responsibility for the land the operators also took on responsibility for the condition of that land, given that their operations have an

impact on the pre-existing condition of the land. This is particularly the case becasue the bulk of operations associated with the windfarm have since *increased* the rate of water loss from the peat habitat – indeed one of the key recommendations of the original AGEC (2004) report was that a 'robust drainage network' be established as quickly as possible across the site. Such operations can only have added to the existing shrinkage of the peat and prevented re-wetting of the ground where forestry has since been removed.

It might also be argued in defence that the majority of fieldwork had been completed by the time Lindsay & Bragg (2005) had been published and highlighted the presence of cracks, to which there are four possible responses:

- the evidence of intense cracking beneath forestry has been in the public domain since the 1990s, and Lindsay & Bragg (2005) merely highlighted what was already known;
- the AGEC (2004) report also mentions cracking within the forestry plantations;
- once the cracking had been pointed out, further ground survey should have been undertaken to establish the scale and extent of this problem. No such ground survey has ever been undertaken;
- by 2020, ignorance of such cracking is not a tenable position, meaning that it should have played a key part in the peatslide risk assessment undertaken in 2020.

It seems likely that there is further failure in basic mapping of the ground condition in terms of how the information obtainable from **aerial photography has been interpreted**. With reference to the aerial photographs provided as '*Figure 10-4 in Section 10.2.1.3*' of the rEIAS and '*Figure 2-1 of Appendix E*', the latter figure points to a dark sinuous band of colour crossing the turbary area and describes it as '*deep peat along subsurface drainage channel*' which is undoubtedly the case, given the sinuous nature of the dark shading.

A similar band of sinuous shading which forms a huge crescentic shape leading down into the same 'shallow valley' which experienced the 2003 peatslide (see Figure 2) is merely identified (along with others) as an '*Area of deeper peat and high water table on flat terraces (Darker vegetation)*' but with no mention of the (very likely) possibility that this, too, is an area of sub-surface piping and/or seepage. Furthermore, the dark zones identified in the NW corner of the aerial photograph and lying just outside the windfarm boundary actually point downslope and converge on a natural drainage line, so it is possible that these, too, are seepage zones or areas of sub-surface piping.

Further areas of dark ground can just be discerned vanishing into the forest blocks within the windfarm site, so it is possible that sub-surface seepage is widespread within the site. These may be natural zones of seepage, but published evidence from, for example, Holden *et al.* (2002) and Holden (2005) have identified a clear linkage between drying peatlands and prevalence of sub-surface piping.

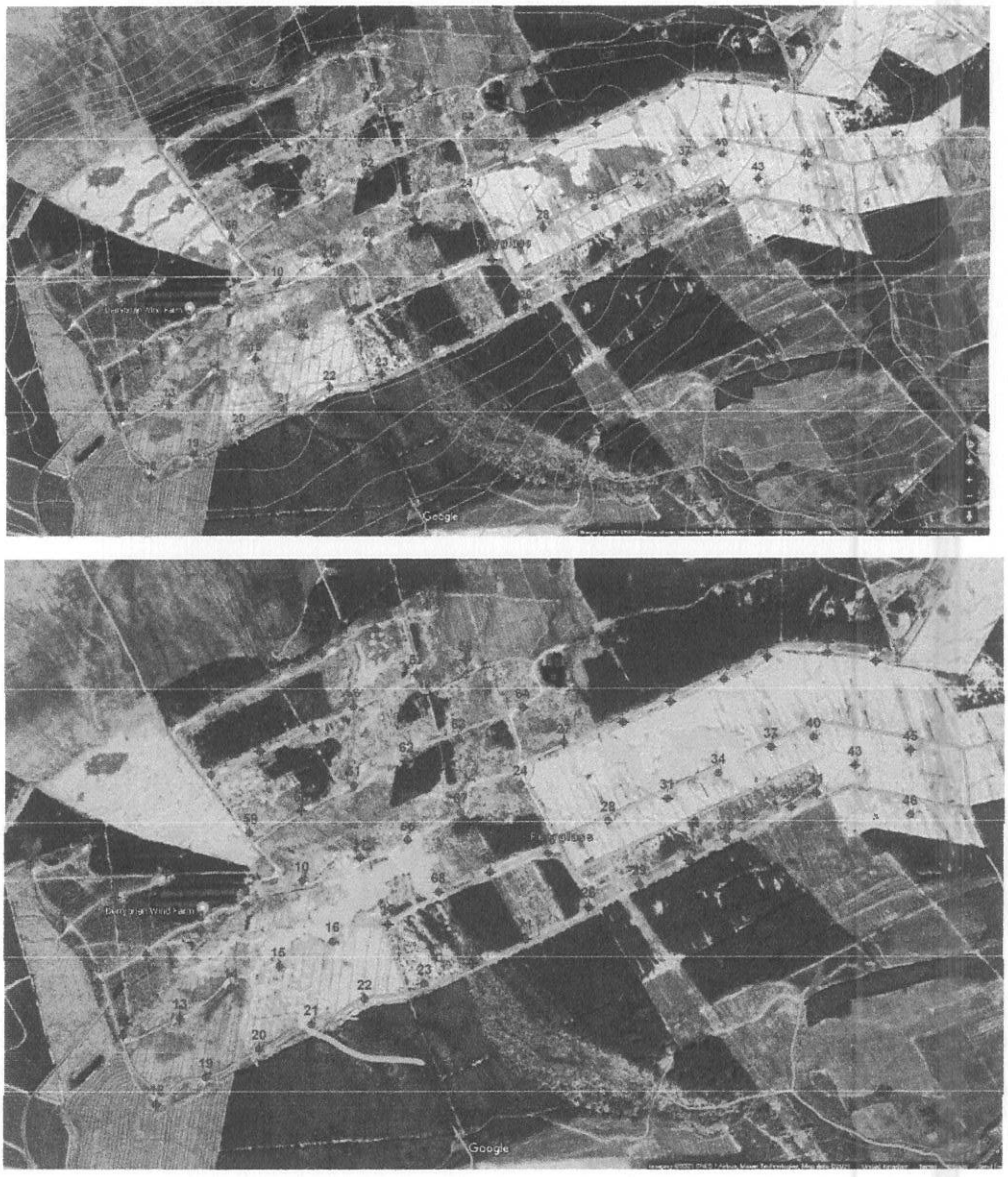

Figure 2. Aerial photograph of the Derrybrien windfarm site with (top) Google Maps aerial photo, contours and turbines; (bottom) Google Maps aerial photo with pale blue shading indicating possible zones of surface/sub-surface seepage. Dotted blue zones indicate areas of possible seepage obscured by tree cover or forest felling operations.

Holden et al. (2002) and Holden (2005) identified such sub-surface piping using ground penetrating radar but there has been no such testing at the Derrybrien site. Sub-surface seepage and piping are identified by SGG-2017 as key features to consider when assessing peatslide risk. Evidence from this initial stage of site mapping, combined with available published literature, plus the guidance from SGG-2017, should all have been brought into the thinking at this stage of the rEIAS, using evidence from aerial photography as well as documented seepage reported extensively from the field data gathered between 2003 and 2005.

It should also be noted that the heads of the pale blue seepage zones in Figure 2 all begin along the line from Turbines 27 to Turbine 42.

5.3 Ground investigation

5.3.1 SGG-2017 – Ground investigation

Ground investigation is divided into three main stages:

- scoping of the investigation;
- peat-depth probing and coring; and
- logging of the peat stratigraphy.

Of particular note are two requirements during this phase:

- within the scoping stage, to record and map evidence of surface and sub-surface drainage pathways and the depth of water strikes encountered during peat probing; and
- to note for the purposes of logging peat stratigraphy that standard approaches to such logging are not suitable and that peat stratigraphy be logged using both the Troels-Smith system and a modified von Post system.

Although shear vane testing is largely covered by SGG-2017 under 'Laboratory testing' (see Section 5.5 below) it is worth highlighting here that the limitations of shear vane testing in peat soils are highlighted within SGG-2017. To summarise the limitations, which are explored more in Section 5.5, there is a tendency for shear vanes to over-estimate the strength of tested peat, and larger-diameter vanes are preferable and more informative than those with smaller diameter vanes.

5.3.2 rEIAS – Ground investigation

There is no doubting the fact that an enormous amount of effort, undoubtedly under arduous conditions, has been expended in gathering peat depth and stratigraphic data from across the windfarm site, particularly between 2003 and 2005.

For present purposes, however, this time period is unfortunate because it pre-dates the guidance provided by SGG-2017. Thus, while the peat-probe data remain robust

and extremely valuable, the **auger data** are less informative because they do not provide the type of information recommended by SGG-2017. Indeed the data would be described as 'unsuitable' by SGG-2017 for the purposes of recording the detailed differences between peat layers because the data do not include von Post or Troels-Smith data.

The solution would seem to have been further collection of auger data using the new recommended recording system. Since 2005, however, coring and trial pits have been almost entirely restricted to the site of the 2003 slide, the peat repository areas or the grid connection route, as indicated in '*Drawing 003 of Appendix A of Appendix B*' and '*Figure 2 and Drawing no: P2159-0600-OHL-0001 of Appendix D*'.

In addition, while the **peat probe data** are indeed robust, it is clear that sample points have consistently been restricted to spot locations where the peat is intact rather than cracked or fissured. Had some probe measurement been taken from the bottom of forestry ploughing furrows, for example, there would undoubtedly have been many measurements that would have registered as anomalous within the datasets. It is, in fact, very difficult to judge the actual depth of peat remaining at the bottom of a deep fissure, so it may be that some measurements were attempted to be obtained but were abandoned in favour of probing an adjacent area of peat that was not fissured.

Whatever the reason for a complete absence within the peat-probe data of anomalous data values indicating fissures, it is most unfortunate that the probing work did not *also* record the presence of fissures along the bottom of forestry ploughing furrows while taking probe readings. It is easy enough to do, simply probing along the base of the furrow with whatever is used to measure peat depths while walking alongside the furrow. Often such fissures are hidden because they are covered with needle-fall, but a probe will immediately and easily pass through this layer to reveal a void beneath.

The largest body of data presented in the rEIAS concerning peat strength is based on hand-held shear vane testing in the field. These shear vane tests were mostly carried out using a Geonor H-60 hand-held shear vane. This device has an extremely small vane diameter (25.4 mm maximum) and can only sample to a depth of 3 m. Consequently, extensive areas of the site could not be sampled at depth (see '*Figure 10-9, rEIAS*') using this device.

Finally, there are numerous references in the field data to the presence of **surface and sub-surface seepage**. Some field sheets ever require a record to be made of such features (e.g. '*Peat Stability Assessment Worksheets, Appendix B of Appendix B*'. However, although '*Drawing 11-147-03 of Appendix B of Appendix B*' claims to show both the natural pattern of drainage plus added artificial drainage, there is no attempt to link up the field data and indicate on this or any other map areas of surface seepage and suspected sub-surface seepage or piping across the windfarm

site or the line of the grid connection. The only mapped indication of seepage is offered for the Turbary area, in '*Figure 2-1 of Appendix E*'.

This failure to collate the information obtained during field survey into some form of map display means that, at the very least, the process of subsequently integrating the factors relevant to slope stability into a risk assessment is not transparent to the reader. It also leaves open the possibility that current risk analyses may have failed to integrate adequately the information contained within these field data (field data, it should be noted, which are now in any case as much as 20 years old and perhaps no longer representative of current conditions).

Regarding the route of the Grid Connection, '*rEIAS, Figure 10-23*' shows peat depths along the corridor of the grid connection chosen for assessment. No explanation is provided in the rEIAS or its Appendices for the width of the corridor selected, but '*Drawing No. P2159-0600-OHL-0002, Appendix D*' states that the corridor is 100 m wide. It is inappropriate and contravenes the principles set out in SGG-2017 for the grid connection assessment to employ a constant width of assessment corridor when ground conditions are so varied along the route. Given that peat depths alone range from zero to 5.6 m, then other factors identified as important by SGG-2017 also vary, any assessment should adjust the width of potential impact according to these changing conditions. Furthermore, the fact that almost the entire length of the grid connection route runs through afforested peatland of varying depths ('*Section 3.2, Appendix D*'), and this peatland is certain to have experienced shrinkage and fissuring, mapping of such features in relation to the chosen route would have been a major source of valuable information in terms of assessing potential risk. Such mapping was not undertaken.

However, even within the constrained approach adopted for the rEIAS, the methodology employed fails to meet the guidance provided by SGG-2017. The report for the grid connection provided by Fehily Timoney ('*Appendix D*') states that: *"Shear vane testing was carried out using a Geonor H-60 hand field vane tester. From FT's experience hand vanes give indicative results for the in-situ undrained shear strength of peat and would be considered best practice for the field assessment of peat strength. 75 no. hand shear vane strength tests were undertaken by AGEC at depths from 0.5 to 2.5m bgl."*

It would seem that although Fehily Timoney (2020) claim to be using SGG-2017 as guidance ('*Section 8, Appendix D*') they do not address the cautionary statements made by SGG-2017 regarding the use of shear vane testing for risk assessment. Furthermore, the Geonor H-60 only has a maximum blade diameter of 25.4 mm and can only be used down to a depth of 3 m. The small blade size fails to meet the very clear guidance from Long (2005) that the largest possible blade diameter should be usedif employing shear vane testing in peat. The specification of the device also means that testing to depth in the deepest areas of peat identified along the grid connection route – namely PS28, PS36 and PS37 to PS39 – was not possible. No

auger samples were taken and only two trial pits, near the sub-station, were made. The ground investigation thus fails along the entire length of the grid connection to provide von Post data and Troels Smith data, as recommended by SGG-2017. This also means that there are no corroborating data against which to judge the shear vane measurements, nor to provide evidence of conditions within the peat at depths greater than 3 m.

5.4 Other ground investigation techniques

5.4.1 SGG-2017 – Other ground investigation techniques

SGG-2017 guidance identifies four aspects of ground investigation for consideration:

- Geophysical testing using non-intrusive methods;
- Digging and examination of trial pits;
- Instrumentation and monitoring; and
- Representation of peat-depth data.

The SGG-2017 guidance provides a summary ('*SGG-2017, Appendix B*') of possible non-intrusive geophysical methods than can be used to investigate the below-ground structure of the peat. These methods can be extremely useful in identifying voids or cracks within the peat, as demonstrated by Holden et al. (2002). Such methods are used as standard practice in much archaeological investigation to identify hidden discontinuities within the soil.

Instrumentation is highlighted as being particularly useful for monitoring water tables, characterising the hydrological behaviour of the peat and identifying signs of movement at crack locations. It notes that: *"The shorter the monitoring period, the less representative the data will be of longer-term trends and extreme responses...In areas where ground movement is possible, the monitoring would...comprise a baseline survey and permanent monitoring network such that if movement were to occur, it could be accurately determined from retrospective surveys."*

The SGG-2017 guidance also emphasises the importance of presenting the results of peat depth surveys appropriately.

5.4.2 rEIAS – Other ground investigation techniques

Given the identified fact that the peat beneath the forest plantations is significantly dissected by fissures resulting from peat shrinkage as the peat has dried beneath the plantation. Given the significance afforded by Dykes (2008) to such conditions, there can be little doubt that a **geophysical survey**, even if across only a sample zone, would provide a clearer indication of the scale of the problem than is currently recognised in the rEIAS. Although some resistivity work was undertaken for AGEC (2004) no results were ever reported.

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As identified in 5.3.2 above, a simple peat probe can provide a practical method of mapping site-wide fissures, but such information would benefit from additional geotechnical mapping in order to identify the presence of sub-surface piping – a feature that cannot readily be identified using a peat probing rod.

With regard to **instrumentation and monitoring**, particularly in the light of the explicit recognition given in SGG-2017 to the monitoring of cracks and fissures, there would appear to be a compelling case for a permanent site-wide monitoring system focused particularly on the fact that much of the peat has been (and in some cases continues to be) subject to drying, shrinkage and fissuring as a result of the historic use of the site for plantation forestry. The same holds true for the turbary area, particularly because of the large seepage zone traversing it, although continued use of the turbary poses certain challenges for the maintenance of permanent marker points.

The rEIAS repeatedly states that mitigation measures will alter the nature of the peat by drying it out, thus increasing its tensile strength. Such drying inevitably means physical deformation of the peat as it loses the prime component of its volume. While deformation beneath the loading of roads and other infrastructure will probably (though not certainly) mean that such deformation will occur largely in the vertical direction leading to subsidence of the 'floating roads' (of which more later), areas not under vertical compressive load are free to shrink in 3 dimensions. This inevitably leads to cracking, fissuring, formation of internal voids and piping or even lifting of the peat from the mineral sub-base to form water channels. Such features are precisely what many authors including Warburton, Holden & Mills (2004), Dykes & Warburton (2007a) and Dykes & Warburton (2007b) highlight as key contributory factors to peatslope failure in the event of powerful convective rainstorms following extended dry periods.

Movement resulting from cracking, fissuring and other forms of deformation can be monitored and measured using a range of standard devices, and indeed following recommendations set out in AGEC (2005) and ESBI (2006), for the period between 2006 and 2014 a set of automatic monitoring devices was installed at four locations across the site measuring soil-water depth/pressure (12 piezometers) and ground movement (15 tilt-meters). By 2012 these instruments had apparently ceased to function so they were decommissioned permanently in 2014.

In addition, seven 'sighting posts' were installed at four locations of concern withing the 2003 slide area, to be measured for signs of movement. Details of these monitoring devices are given in '*Appendix B, Section 3.3.3.1*' and '*Appendix C, Section 7*'. The location of the 'sighting posts' is given in '*Appendix B, Section 5.2.1*' while the detailed locations of the automated piezometers and tilt-meters are shown in '*ESB (2006) Operation and Maintenance – Provisions for Long Term Site Stability, Appendix 1*' (listed but not supplied) and in more general form by '*Drawing No: QS-00192-01-D451-016 in Appendix A of Appendix B*'.

A number of observations can be made about these monitoring systems:

- A key recommendation of AGEC (2004) is that: *"Ongoing ground investigation work should continue with regular monitoring of specialist movement detection equipment, site roads and other works."* Furthermore, Fehily Timoney (2020) '*Appendix C, Section 7*' notes that this instrumentation was: *"...installed to give early warning of irregular/unusual ground movements or water pressure build up."* Given the repeatedly-stated expectation of the rEIAS that the peat will change in character over the lifetime of the windfarm, together with the concerns of SGG-2017, Dykes (2008) and others over fissuring as a result of such drying and the focusing of intense rainfall into such fissures, the decision to de-commission this monitoring array would not seem to be justified.
- The remaining monitoring system – namely the 'sighting posts' – are located outside the main windfarm site and are designed purely to monitor material that has already suffered failure. This is probably the least likely area to experience further movement now that the bulk of material has settled or passed out of the area completely. Of much greater concern are the areas of deep peat still located within the windfarm site and currently undergoing drainage in an effort to 'mitigate risk of a further peatslide' – although such actions actually have the potential to *increase* the risk of further slope failure (see later).
- Even if the automated monitoring systems had been retained, their limited number and distribution across the site would have provided only the most localised information about possible signs of fissuring or movement. It is unfortunate, for instance, that the instrumentation linked to Logger 3 was not located within the identified zone of sub-surface seepage crossing the turbary area because then perhaps an increase in soil-water pressure might have given warning of the peat failure in Turbary Plot No.161, which lies directly in the path of this seepage line (see Figure 1 above). Other areas of seepage or peat piping identified from field data sheets would also have benefitted from (and would continue to benefit from) such instrumentation. A compelling case can be made for much wider instrumentation of this type to be distributed across the site and for it to be maintained, as a minimum, for the operational life of the windfarm.
- As a supplement to such instrumentation, the possibility now exists to use satellite data to monitor ground movement. Using InSAR satellite data, Professor David Large at the University of Nottingham has studied another large peatslide which recently occurred at an afforested windfarm in Ireland. His initial unpublished results suggest that, not unlike a volcano before it erupts, distinctive ground-motion signals detectable using InSAR may provide early warning of possible failure. As with all remote sensing, ground-truth data are still necessary in order to validate such analysis, but

this may enable the scale of ground-truth instrumentation to be reduced and thus make the monitoring programme more cost-effective.

With regard to **presentation of the peat-depth data**, while the interpolation method used in *'rEIAS, Figure 10-9'* appears reasonable, what is not reasonable is the choice of colours to display that map. This may seem a trivial point, but it is normal when displaying a gradient of something to go continuously from dark to light or light to dark. In the case of *'rEIAS, Figure 10-9'*, this convention is not followed. Rather than the palest colour (yellow) indicating the shallowest peat this colour actually represents peat depths between 1 m and 2 m – so substantial depths – whereas the darker red shading indicates depths of between 0 m and 1 m. The position is rendered even more confusing because in *'Figure 3, Appendix XIV of Appendix D of Appendix B'* the green and yellow shading are reversed, with the paler yellow colour now representing peat that is 2 m to 3 m deep.

5.5 Laboratory testing

5.5.1 SGG-2017 – Laboratory testing

SGG-2017 guidance identifies three issues to consider when undertaking laboratory testing of peat samples:

- Physical properties of peat;
- Shear strength tests in peat; and
- Selection of appropriate site plant and safe working practice.

The SGG-2017 guidance provides a number of cautionary statements concerning the testing of peat and its physical properties, as do papers such as O'Kelly (2017), Dykes (2008), Yang and Dykes (2006) and Long (2005):

- Standard particle size distribution tests can be misleading and should be used with caution;
- Fibre-content is an important consideration and tests which take this into account are often more informative;
- Standard shear-strength testing can be unreliable in peat depending on the nature of the peat being tested;
- Any laboratory testing should state clearly the precautionary measures taken to allow for the particular properties of peat (e.g. provisions for effects of fibre content) and highlight possible areas of uncertainty.

It is important to recognise, however, that such testing only relates to intact blocks of peat, as highlighted in SGG-2017. Such testing gives little or no information about

the behaviour of a peat mass which is riven with cracks and fissures, nor a mass that has separated through vertical shrinkage along a weak layer or at the peat-mineral interface. As such, the capacity for shrinkage of peat when subject to drying is a major consideration which lies outside the capacity of laboratory (or even much field-based) testing to measure, other than identification of the humification state of the peat or perhaps the occasional fortuitous capture of a fissure during shear-vane testing, giving rise to anomalous results.

While actual identification of fissures obviously gives a direct indication of ground state, the degree of humification as indicated by a von Post test gives an indication of the susceptibility of a given section of peat to shrink and crack under the stresses generated by drainage. Peat with a low von Post value of anywhere between H0 and H4 will shrink much less than a highly decomposed peat with a von Post value of H8 or H9. This is because little-decomposed peat contains many more long fibres which help to bind the peat matrix together and give it a high tensile strength. Figure 3 shows a close-up of peat with a von Post value of H1 (i.e. largely undecomposed). The mass of Sphagnum bog moss stems and branch spindles can be seen to interconnect somewhat like tangled scaffolding, preventing any significant degree of shrinkage.

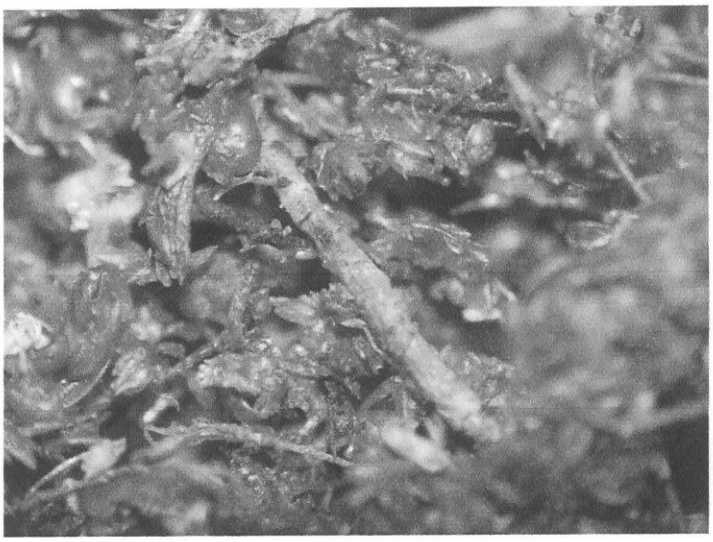

Figure 3. Close-up of largely undecomposed peat (von Post value of H1) showing the numerous lengths of moss stem and branch spindles set within the matrix of loose leaves.

Figure 4 shows the difference in shrinkage between peat cores having differing von Post values. The higher the von Post value (i.e. the more decomposed the peat) the greater the extent of shrinkage, cracking and fragmentation.

Laboratory testing is thus only part of the story because it cannot readily mirror and test the effect of such fissuring on the mass of peat as a whole.

Figure 4. Variable shrinkage due to drying of peat cores, taken from a bog in northern England, having differing von Post values. (top) Core just after removal from the bog; (middle) Core unwrapped for drying; (bottom) Differential shrinkage and fragmentation of cores following drying, with greatest shrinkage occurring in cores with high von Post values.

5.5.2 rEIAS – Laboratory testing

Between 2001 and 2005 some peat samples were subjected to laboratory analysis, but the text is contradictory about where these samples were taken. The only descriptions of samples taken for laboratory testing relate to the peatslide area and a section of floating road, but then the text ('*Annex B, pp. 29-30*') talks of samples 'away from the slide area', without any details of what this means. As far as can be ascertained from '*Annex B, Figure 2-7*', this refers to a set of samples taken at Turbine 22. Consequently the full set of laboratory-tested material consisted solely of:

- 12 peat samples taken in 2001 for which moisture content was calculated (although the results are profoundly anomalous for peat and suggest that they cannot be relied upon), together with chemical analyses undertaken on six of these samples;
- an un-specified number of samples taken from the area of the 2003 peatslide (possibly 11 samples) and 'away from the slide' – at Turbine 22 (possibly 21 samples), which were subject to shear strain and triaxial testing; and
- an unlisted number of samples taken adjacent to the floating road west of Turbine 17 following signs of movement, also subject to shear strain and triaxial testing.

This hardly represents site-wide laboratory testing of peat characteristics, but, as indicated above, the strength of intact peat is not the key issue in this case. It is the *in-situ* behaviour of the peat body when subject to drying and consequent shrinkage which is of greater concern, particularly as rEIAS field-data sheets (final items in '*Appendix B of Appendix B*') suggest widespread occurrence of peat which is H8-H9 and therefore especially prone to substantial shrinkage on drying. The fact that H8-H9 peat also has much less tensile strength than less decomposed peat is a compounding concern.

6. Hazard and risk assessment

The SGG-2017 guidance highlights the fact that the probability of a peat landslide *"...reflects the combined influence of preconditions, preparatory factors and*

triggering factors, or collectively 'controls', on the stability of a peat deposit." It also makes clear the potential de-stabilising impact of human activity on peat stability.

6.1 Assessing the likelihood of a peat landslide

The SGG-2017 guidance offers four ways to assess the likelihood of a peat landslide occurring, grouped into two broad categories:

Probabilistic:

- Historic frequency of peat landslides;
- Use of possible triggering events as indicators of likelihood;
- Estimation of probability using expert judgement using general principles and available evidence;

Stability analysis

- Use of stability analysis and Factor of Safety calculations.

6.1.1 Historic evidence of frequency

6.1.1.1 SGG-2017 – Historic frequency of peat landslides

This approach relies on collation of evidence for peat landslides *within the area* together with the timing of those events. The timescale chosen for such a calculation is obviously a key factor. The example given in SGG-2017 is a 100-year timespan, and *'Table 6.1 of Appendix C'* identifies two peatslide events which have occurred within a 10 km radius of the Derrybrien windfarm site since 1921.

Combining these with two on-site failures in 2003 (Turbine 68 and the earlier failure at Turbine 17), plus the failure in Turbary Plot No.161, gives a total of five failures in the area within the past 100 years.

From this, the Annual probability = 5 slides/100 years = 0.05 or 5%.

Taking the windfarm lifetime of 25 years, the calculation suggested by the SGG-2017 guidance is:

Prob. (Peat landslide) in 25 years = $1 - (1 - 0.05)^{25} = 0.72$ or **72%**

In practice, however, conditions prevailing in the general area have changed significantly in the past 50 years with the establishment of plantation forestry over many blanket mire areas. More recently still, construction of windfarms within these forested areas has had further impacts. This might suggest, therefore, that a more realistic contextual timescale reflecting current conditions could be 50 years or even time since 2001, when widespread windfarm construction began in the area. On this basis, the calculation becomes:

Annual probability = 5 slides/21 years = 0.238 = 23.8% and

Prob. (Peat landslide) in 25 years = $1 - (1 - 0.238)^{25} = 0.998$ = **approx. 100%**

Even just taking the large 2003 slide and the slide at Sonnagh Old, this gives:

Annual probability = 2 slides/21 years = 0.095 = or 9.5%

Prob. (Peat landslide) in 25 years = $1 - (1 - 0.095)^{25} = 0.917$ = **approx. 92%**

Using the historical frequency of landslides *in the area*, this calculation of risk suggests that within the remaining life of the windfarm there is a significant risk of a further peat landslide.

Of course the area on which the calculation is based could be expanded, for example to Ireland as a whole, but in doing so this would merely increase the annual frequency of events, given the number of peat landslides which have been recorded in recent times, many of them associated with windfarm development on blanket bog habitat.

While it must be recognised that this is a rather crude, blunt tool to assess likelihood, this calculation nevertheless gives a broad indication of the **distinct possibility that another peatslide will occur within the Derrybrien windfarm site during the operational life of the windfarm or shortly thereafter.** The calculation gives no indication of scale or locality, but this should alert the windfarm operators to apply all possible measures to minimising such an event and containing its consequences. AGEC (2004) make a specific recommendation that a Contingency Plan be drawn up to prepare for such an event, but there is no evidence that this 2004 recommendation has ever been followed up with practical action.

6.1.1.2 rEIAS – Historic frequency of peat landslides

The rEIAS does not adopt the recommended approach to probabilistic assessment using historical evidence, as set out in the SGG-2017 guidance. Despite stating that *"...the peat stability assessments have been carried out in accordance with the best practice guidelines given in [SGG-2017]"*, the rEIAS instead employs its own formulation for risk assessment, based on peatslides per kilometre of windfarm road construction in Ireland per annum (*'Appendix B, Table 1-1'*).

This is a very different concept from that set out in SGG-2017 and is guaranteed to reduce to a minimum the 'likelihood' value because even a very large peatslide will only ever arise from a relatively limited extent of windfarm road, meaning that the likelihood *per kilometre* constructed is always going to be low.

Such a metric does not in any way reflect the possible likelihood per windfarm development. This is because likelihood is also linked to ground

conditions, meaning that if ground conditions are unsuitable across the whole development a small windfarm may still have a high likelihood of slope failure.

It is not clear how the 'Probability of Occurrence' in '*Appendix B, Table 1-1*' ultimately influences or relates to the Peatslide Risk Assessment zones arrived at from '*Appendix B, Table 2-2*' and displayed in '*Appendix B, Figure 2-17*' but it is clear that the effect of '*Appendix B, Table 1-1*' is to suggest that a peatslide is an extremely unlikely event. This is a very different message from that obtained if using the approach recommended in the SGG-2017 guidance.

6.1.2 Role of triggering factors

6.1.2.1 SGG-2017 – landslide triggering factors

The SGG-2017 guidance points readers to published evidence of the role that triggers play in causing peatslide events. The guidance cites Evans & Warburton (2007), Dykes and Warburton (2007a) and Creighton (2006), but Dykes (2008) has undertaken an extensive analysis of peatslide events and produced a table which summarises the various factors that appear to play some part in triggering such events or preconditioning sites to the effects of triggers. An extract of his results relevant to the present case is presented in Table 1.

It can be seen from Table 1 that preconditioning and trigger factors relevant to Derrybrien are not factors that occur rarely. They are instead common features of many recorded peat failures. Of particular note is the regularity with which convex slopes and heavy rainfall feature in such events. Convex slopes are a widespread feature of the windfarm site. Meanwhile, climate projections indicate that rainfall is likely to become more intense, along with extended dry periods. This would intensify the tendency for peat to shrink and fissure where it is already under drainage pressure, providing many more routes for intense rainfall to find weak points in the fissured matrix and lift the peat from the mineral sub-soil.

In direct contrast with the stated intention to maintain robust drainage across the site, it is widely acknowledged that the most effective strategy for peatland systems in the face of such shifts in climate is to encourage restoration of Sphagnum-rich peat-forming vegetation. This is because Sphagnum-rich assemblages have self-regulatory processes which enable them to adapt to such changes while still laying down fresh peat. This new peat can, amongst other things, provide a protective layer of high tensile strength.

Table 1. A selection of Irish blanket bog failures and inferred contributory factors (taken from Dykes, 2008). B/E = burnt or eroded; BD = boundary ditch; DD = drainage ditch; FD = forestry drainage/ploughing; PC = manual peat cutting; PE = machine/Difco extraction; PL = loading onto peat; CV = concave slope; CX = convex slope; HA = heavy antecedent rain; LA = dry antecedent conditions; mineral sub-soil failure; SP = seepage peat pipes; PB = peat bank; HR = high rainfall; UN = unknown trigger. Yellow shading indicates those factors relevant to Derrybrien, from which it can be seen that those factors have been common features of many recorded peatslides.

Peat landslide	Anthropogenic preconditioning factors							Natural preconditioning factors							Triggers	
	B/E	BD	DD	FD	PC	PE	PL	CV	CX	HA	LA	MS	SP	PB	HR	UN
Lough Boleynagee, Co. Mayo									Y	Y			(Y)	(Y)		Y
Maghera (1939), Co. Claire									Y						Y	
Glendun, Co. Antrim								Y		Y					Y	
Barnesmore, Co. Donegal			Y		Y			Y							Y	
Carrowmaculla, Co. Fermanagh	B	Y							Y	Y					Y	
Tullynascreen, Co. Sligo						Y			Y	Y					Y	
Straduff, Co. Sligo	B								Y		Y	Y			(Y)	
Maghera (200?), Co. Claire				Y					Y							Y
Slieve Bloom (1988), Co. Laois			Y						Y							Y
Conaghra, Co. Mayo				Y					(Y)					(Y)		Y
Meenacharvy, Co. Donegal	E				Y				Y						Y	
Slieve Rushen (1965), Co. Cavan					Y				Y	Y					Y	
Berllacorrick Forest, Co. Mayo				Y				Y			Y					
Skerry Hill (x2), Co. Antrim			Y					Y			(Y)				Y	
Carntogher, Co. Londonderry	E		Y					(Y)	Y	Y			(Y)		Y	
East Cuilcagh (1986), Co. Cavan								Y						Y		Y
East Cuilcagh (1992), Co. Cavan								Y						Y	Y	

Peat landslide	Anthropogenic preconditioning factors							Natural preconditioning factors							Triggers	
	B/E	BD	DD	FD	PC	PE	PL	CV	CX	HA	LA	MS	SP	PB	HR	UN
East Cuilcagh (1998), Co. Cavan								Y						Y		Y
Slieve Bloom (1973), Co. Offaly			Y													Y
Cuilcagh (1986), Co. Fermanagh										Y		(Y)			Y	
Dooncarton Mtn., Co. Mayo						Y					Y	(Y)			Y	
Slieve-an-Orra (x7), Co. Antrim			Y	Y				Y	Y	Y		Y			Y	
Slievenakilla (x2), Co. Leitrim					(Y)			Y	Y		Y	Y			Y	
Cuilcagh (1998), Co. Fermanagh			Y								(Y)	Y	Y		Y	
Cuilcagh (2000), Co. Fermanagh			Y								Y	Y			Y	
Dooncarton Mtn.		Y							Y		Y	Y	Y		Y	
Dooncarton Mtn. (x9), Co. Mayo									Y		Y	Y	Y		Y	
Slieve Bearnach, Co. Claire				Y			Y	Y								
Sonnagh Old, Co. Galway				(Y)			Y		Y							
Derrybrien (x2), Co. Galway			Y	Y			Y	(Y)			Y					

6.1.2.1 *rEIAS – landslide triggering factors*

Although in "*Appendix B, Table 3-3*" the rEIAS acknowledges most of the factors identified by Dykes (2008) and displayed in Table 1, it appears to summarise these into a small number of factors to which it then allocates a scoring system in '*Appendix B, Section 2.5.3 and Table 2-2*'. These factors are:

- Deposits of deep (3-6 m) and relatively deep (2-3m) weak peat (cu ≈ 4-5 kPa) with low infinite slope Factor of Safety (<1.0-1.3);
- Areas of intermediate slope angles of 3-5° in close proximity to a convex break in slope to slope angles >5°;
- Zones that are in the broad valleys directly upslope from the rivers and streams downslope from the site boundary;
- Zones of deep peat with poor drainage and ponded surface water at the head of a watercourse, or along the edges of the terraces on the north side of the site; and
- Areas adjacent to the previous slide that have similar site characteristics.

This list does not mention presence of drains or forestry ploughing and the impact these have on breaking the tensile connectivity across the peat mass, nor does it mention the impact drainage has on the shrinkage and deformation of peat, nor does it recognise the implications of future intense rainfall or longer periods of dry weather. It focuses instead on areas of poor drainage with high water tables, with the implication that these must be drained in order to provide improved stability – and indeed this is the main mitigating strategy offered by the rEIAS throughout all the documents.

6.1.3 Expert judgement

6.1.3.1 *SGG-2017 – Expert judgement*

If using expert judgement, the SGG-2017 guidance states that such an approach may use a ranking system, ranked on the basis of expert judgement, based on: "*...the presence or absence of instability features at the site, or combinations of scored 'hazard factors' (e.g. slope, peat depth, orientation of slope drainage) whereby higher scores indicate higher probability of future peat landslides.*"

The guidance goes on to emphasise that: "*Where expert judgement is used, judgements should be transparent through full documentation of sources of evidence, and the logic behind any factoring or scoring approach should be clearly detailed.*"

6.1.3.2 *rEIAS – Expert judgement*

The rEIAS presents a case which, on the face of it, is based on thorough and rigorous quantitative measurement of site conditions rather than employing expert judgement to assess the probability of slope failure or other negative impacts. However, expert judgement is central to the process of deciding what factors to measure, how extensively these factors should be measured, and ultimately how the results should be interpreted.

The consequences of expert judgement in this case have significant implications for the results obtained and conclusions derived from the quantitative approach to risk assessment. These issues are explored in detail below.

6.1.4 Stability analysis

6.1.4.1 *SGG-2017 – Stability analysis and Factor of Safety*

The approach offered by the SGG-2017 guidance allows for a quantitative approach to hazard and risk assessment. This is the approach most familiar to geologists, soil scientists and engineers. It uses factors such as soil cohesion, angle of internal friction of the material, slope angle and weight of the material to calculate a Factor of Safety (FoS). If the calculated FoS for a portion of ground is less than 1 it is assumed that slope failure is certain, but it is general practice to allow for a margin of safety such that a value of 1.3 or 1.4 is taken to be the limit of acceptability.

Several software packages are available from which to derive FoS values, based on a variety of different approaches by which FoS values are calculated. As highlighted in SGG-2017, the favoured system, particularly for peatland soils, has increasingly become the 'infinite slope model' which divides a slope into small segments in order to calculate differing values for differing portions of a slope.

The general underlying calculation used to generate FoS values when the ground is drained is:

$$FoS = \frac{c' + (\gamma - m\gamma_w) z \cos^2\beta \tan\emptyset'}{\gamma z \sin\beta \cos\beta}$$

where:
- c' is effective cohesion
- γ is bulk weight of saturated peat
- γ_w is bulk weight of water
- m is the fractional height of water in the peat column
- z is (in effect) the peat depth
- β is the slope angle
- ϕ' is the effective angle of internal friction of the peat

The important point to bear in mind is that this formula describes the characteristics and behaviour of peat as a discrete entity but if the peat is fissured and deformed as a result of shrinkage then values obtained by shear-vane testing for c' are unlikely to capture the true effective cohesion of the peat slice, even if the vane happens to intersect with a fissure.

In addition, if the peat has fissures and internal pipes resulting from shrinkage and deformation, thereby permitting water to enter weak layers in the peat or voids at the interface between the peat and underlying mineral, the effective angle of internal friction ϕ' will also be different from that calculated for normal conditions because water will lubricate that layer, reducing the angle of friction.

From the formula above it can been that, for a constant depth of peat and slope angle, if effective cohesion and angle of internal angle of friction are reduced, the Factor of Safety will also be reduced.

If the peat has been subject to intense drying through a combination of drainage and a long dry spell, the weight of the peat will also be reduced, making it more buoyant and more easily lifted from a weak layer by hydrostatic water pressure.

These factors together mean that considerable caution is required when using calculated Factor of Safety values for an area of drained peat. As Dykes and Warburton (2008) observe: *"In the context of high magnitude, high intensity rainfall events, landslide hazard assessments should identify any disturbance to the physical integrity of a peat deposit, and any undisturbed blanket peat cover on convex upper mountain slopes (not visibly affected by erosion or previous failure), as sites susceptible to failure."*

O'Kelly (2017) further concludes that: *"The tensile strength of fibrous peat material is important in understanding bog burst and bogflow events in upland blanket bog peat deposits, for the stability of 'floating' roads over peatland, and also seems important in stability assessments of embankments, dikes and foundations over peat substratum...Since back-analyses of slope and foundation failures involving peat deposits indicate that even a small [cohesion and tensile strength] value can play a significant role, further investigations on the tensile strength mobilised for submerged test specimens with different botanical compositions are necessary, along with a renewed effort on understanding tensile strength development and fracturing of in-situ peat deposits under loading."*

6.1.4.2 *rEIAS – Stability analysis and Factor of Safety*

A succession of sampling and testing regimes to determine peat strength as well as other factors relevant to peat stability, has been undertaken since 2001.

In 2001, IGSL dug eight **trial pits** from which they determined the depth of peat and its general composition (*'Appendix I of Appendix D of Appendix B'*). A **light dynamic probe** was used to determine the strength of material at 58 locations, but this type of probe is not well suited to peat soils, meaning that with a single tap the probe reached the mineral sub-base and therefore not revealing much about the nature of the peat. In addition, 24 samples were obtained for laboratory analysis using a **hand auger**, with the intention that measured water content would give an indication of peat strength.

The trial pits and probe did not provide any useful information about peat strength, while the reported water contents obtained from the auger samples were so low (for peat) that there must be a suggestion of something having gone awry during the course of testing. Nonetheless, IGSL concluded that: *"...The peat must be considered unsuitable as a founding material, from both a strength and compressibility viewpoint..."*

This was the only testing of peat stability undertaken prior to the start of construction.

Table 2 summarises those surveys providing **field data** relevant to peat strength which have been undertaken since the 2003 peatslide, from which it can be seen that all testing of the site as a whole ended in 2005. Testing since then has been limited to individual points of concern such as the source area of the slide, the peat barrage repositories or areas of instability associated with individual turbines and their road sections.

At the same time (as the rEIAS emphasises repeatedly) the nature of the peat across the development has been changing because of the construction loading and the extensive drainage programme. However, these changes are not being monitored. They are instead merely assumed to be proceeding within an expected framework of behaviour. This framework is, however, limited in its outlook and does not recognise potential changes due to shrinkage that lie outside this conceptual framework – despite clear warnings about such changes set out in literature ranging from Lindsay & Bragg (2005) to the SGG-2017 guidance and beyond.

Lindsay & Bragg (2005) illustrate the scale of cracking and fissuring to be expected beneath any forestry plantation established on peat. Their Plates 3.1 and 3.2 show just how intense and deep this fissuring can be. Adding to this, the ongoing and additional drainage regime maintained in order to keep

windfarm operations free from waterlogging leads to further de-watering, with consequent loss of volume, within the surrounding peat.

Notwithstanding the lack of data since 2005, the existing datasets for shear strength highlight three significant features which are noted within the rEIAS and its accompanying documents, though the implications of these features are not explored at all.

Firstly, It will be noted from Table 2 that shear vanes come in different sizes – specifically the vane-blade widths used in the rEIAS datasets range from 25.4 mm diameter (AGEC, 2004) to 270 mm diameter ('*Section 3.3.2, Appendix D of Appendix B*'). Despite the conclusion by Landva (1980) that shear vane testing of peat "*does not serve any useful purpose*", and the SGG-2017 guidance highlighting questions raised by Long and Boylan (2012) about the reliability of such tests, shear vane testing continues to be widely used in EIA work because of its reliability on soils other than peat. It is consequently regarded as an 'industry-standard' technique for all EIA investigations despite its unsuitability for peat soils.

O'Kelly (2017) highlights the fact that, in peat, larger vane blades tend to produce lower values, attributing this to the fibrous nature of peat. The question therefore arises: Do the lower values obtained by larger blades better reflect the true strength of the peat than smaller blades? Long (2005) is very clear on this point: "*If the field vane is to be used in practice, it should be as large as possible...*" Long and Boylan (2012) furthermore state that "*...in-situ vane tests may grossly over-estimate the shear strength of peat deposits...*" They go on to observe that "*...vane tests in peat may give misleading and non-conservative results and should be treated with great caution.*"

Table 2. Surveys which obtained field data relevant to the assessment of peat strength and stability.

Date	Company	Locations	Test type	Function	Appendix No.
Feb. 2004	AGEC	50 locations 'T-cells' ?	Shear vane (small)	Shear strength of peat	Appx. A
Nov. 2004	AGL/Ascon 03-104-R01	Turbine 36 x 'T-cells'	Gouge auger	Peat depth, slope angle	Appx. B, D, III, A
"	"	" 25 x 'T-cells'	Shear vane (large)	Shear strength of peat	"
Dec. 2004	AGL 03-104-R02	Roads 42 x 'T-cells'	Gouge auger	Peat depth, slope angle	Appx. B, D, IV, A
"	"	" 36 x 'T-cells'	Shear vane (large)	Shear strength of peat	"

Jan. 2005	ESBI 78015-C11-R1 REV 1	Throughout the site	Abney level	Slope angle	Appx. B, D, XIV, A
"	"	" 222 x locns.	Gouge auger	von Post humification	Appx. B, D, XIV, B
"	"	" 1179 x locns.	Shear vane (large)	Shear strength of peat	Appx. B, D, XIV, C
May 2005	AGL 03-104-R06	Test road 4 x sample locations	Gouge auger	Peat depth, consistency	Appx. B, D, VI, A
"	"	"	Shear vane (large & v. large)	Shear strength of peat	"
May 2005	AGL 03-104-R05	Road by T70	Gouge auger	Peat depth, slope angle	Appx. B, D, XIII, A
"	"	"	Shear vane (large)	Shear strength of peat	"
Dec. 2011	AGEC	Barrages 48 x locns.	Shear vane (?)	Shear strength of peat	Appx. C, G
"	"	Peat-slide area 48 x locns.	"	"	Appx. C, G
June 2018	AGEC	Repository areas	Shear vane (large?)	Shear strength of peat	Appx. C, B
July 2020	Fehily Timoney	Peat-slide area	Shear vane (large?)	Shear strength of peat	No data
"	"	Repository areas	Macintosh probes	Strength of peat	Appx. C, B
"	"	"	Trial pits	Von Post humification	"

Landva's published results and conclusions date back to 1980 with such concerns being repeated frequently since, even being highlighted within the SGG-2017 guidance. It is a thus source of considerable concern that shear vane testing forms such a central part of the rEIAS assessment of peatslide risk without any discussion about the uncertainties inherent in such an approach. The reliance on shear vane testing inevitably creates a degree of confidence that is potentially unfounded, but no significant attempt is made to acknowledge and explore the potential for such error.

Indeed '*Section 10.2.3.2.4, rEIAS*' states: "*Shear vane testing was carried out using a Geonor H-60 hand field vane tester. From FT's experience hand vanes give indicative results for the in-situ undrained shear strength of peat and would be considered best practice for the field assessment of peat strength.*"

This statement differs significantly from what SGG-2017 and other acknowledged authors says about shear vane testing.

Furthermore, when differing sizes of shear-vane blade have been employed, as discussed and illustrated in '*Section 3.3.2, Appendix III of Appendix D of Appendix B*', the trend revealed within the rEIAS shear vane data displays a clear shift of 30% or more towards reduced peat strength as more appropriate, larger, vane dimensions were used. It is unfortunate that the largest dimension shear vane was used on only a very small testing location within the site.

A second feature of note in this particular dataset (i.e. '*Section 3.3.2, Appendix III of Appendix D of Appendix B*') is that two locations are tested. The first location is Turbine 68, which sits at the head of the 2003 peatslide although the peat around the turbine itself remained in place. The second location is Turbine 56 which is described as "*in forest*". It is striking that both the smaller H10 blade and the larger ESBI blades both give lower strength values for Turbine 56, but the larger-bladed ESBI vane returns an extremely low strength value of 2 kNm^2 at 3 m depth.

One explanation for such a value is that the larger blade encountered a fissure caused by shrinkage of the peat beneath the forestry whereas the smaller blade did not, or did not encounter as much of the cracking as the larger blade. Unfortunately, as can be seen from Table 2, this larger blade was used on only this one occasion, so the implications for the wider site and presence fissures are not revealed in any data presented within the rEIAS. The response in '*Section 3.3.2, Appendix III of Appendix D of Appendix B*' to these limited results is simply to observe: "*However it is difficult to account for the difference between the* cu_{vane} *determined for the different sizes from these considerations. Reliance must therefore be made on practical experience and, if possible, on-site calibration of the results.*" The main rEIAS makes no mention of these results whatsoever and so does not discuss the issue.

A third source of concern must be raised about the rEIAS shear vane results more generally. This is particularly so in the light of issues discussed above about the doubts expressed within the geoengineering community and the size of blades used to obtain peat strength values for the site.

'*Appendix A of Appendix IV of Appendix D of Appendix B*' presents in both tabular and graphical form the field data for shear vane tests taken along the road system 2004, while '*Appendix B of Appendix XIV of Appendix D of Appendix B*' presents in tabular form the field data for the shear vane tests taken from 1179 locations distributed across the site as a whole (and shown in '*Drawing No.3 of Appendix A of Appendix B*').

On looking through both the graphs and the data, it steadily becomes evident that there is a general pattern of a dense uppermost layer of peat but then the strength often declines, sometimes dramatically, at somewhere between 1 m and 2 m depth. There then appears to be a second zone of reduced strength at around 3 m depth.

This pattern is only mentioned within the rEIAS document as indicating a strong, desiccated layer near the surface. There is no comment about these apparently weaker layers although the values associated with these weaker layers are often as low as 4 kNm^2 with the 140 mm diameter shear vane. A reduction of 30% might be expected for a 270 mm diameter shear vane, which would reduce such values to between 2 and 3 kPa (or kN/m^2 – these units are equivalent). Such low strength values would have a significant impact on the overall pattern of Factor of Safety calculations across the site. This should, as a minimum, give rise to expressions of considerable caution if not outright concern.

The presence of such a weak layer would fit with the recorded details of the major slide at Turbine 68 and the lesser slide at Turbine 17. In both cases the recorded shear surface is described as being within the peat some 200-500 mm above the mineral base - i.e. some 1 - 1.5 m below the likely original peat surface ('*Section 3.1.1, Appendix C*', and *Section 9.1 (1), Appendix A*'). This coincidence is potentially significant, worth investigating further, but is not recognised, or at least not commented on, within the rEIAS.

Further evidence for such a significantly weaker layer somewhere between 1 m and 2 m below ground level can be found in the collated shear vane data displayed in AGEC (2004). '*Figures 4 and 5, Appendix A*' highlight the fact that a large number of low-strength values were obtained from between 1 m and 1.5 m below ground level. It should be noted that these values were largely obtained using a very small vane size (25 mm) and therefore almost certainly give higher strength values than would be obtained by the size of vane recommended by Long (2005).

Adding even more weight to the argument that AGEC (2004) values are high and un-representative, the shear vane tests were mostly performed either in the excavated face of a turbine base or in a ditch nearby ('*Appendix B of Appendix A*'). Both of these types of locality would already have at least undergone primary consolidation as a result of drainage effects and therefore not have been representative of the surrounding peat. Such consolidation would tend to give higher shear vane values, giving an impression of greater strength than would be likely in the surrounding peat (unless of course the vane hit a shrinkage crack, but with such small vanes this probability would be substantially reduced).

The same concerns expressed by Long (2005) and Long and Boylan (2012) and the SGG-2017 apply to the 1179 shear vane tests carried out by ESBI (2005) across the site as well as to the 56 tests carried out by either AGL at turbine sites or along roads. If the majority of the values obtained were to be adjusted downwards by some 30%, the many low records at around 1 m-1.5 m would then fall as low as 3 kPa, resulting in a significant shift in calculated Factor of Safety values. The observation of Long and Boylan (2012) that any shear vane test has a tendency to *"...grossly over-estimate the strength of peat deposits..."* should have raised further significant concerns within the rEIAS.

6.1.5 Probability of occurrence

The probability of slope-failure occurrence is generated by assembling all the information described above. It is normally assumed that landslide probability is spatially variable across a site because conditions inevitably differ from location to location across landscapes.

6.1.5.1 SGG-2017 – Probability of occurrence

The SGG-2017 guidance makes clear that the developer should formulate any scale of likelihood based on the developer's understanding of the site conditions. As we have seen above, it is not at all clear that the developer has a good grasp of the site conditions – or even an understanding of their own data.

6.1.5.1 rEIAS – Probability of occurrence

The creation of an inappropriate scale of probability by the developer has already been discussed earlier. Of more interest and significance here is the way in which the rEIAS and the documents on which it is based have assembled the accumulated field data into a spatial picture of peatslide susceptibility.

No such picture was developed prior to commencement of works, but following the 2003 peatslide, AGEC (2004) divided the development area into a contiguous set of seventy one 200 m x 200 m grid squares (hereafter referred to as 'T-cells'), thus creating a somewhat 'pixelated' map of the development. Relevant information for each of these squares was then assembled to generate an indication of susceptibility for each square, with each square being assigned a susceptibility value. Smaller 50 m x 50 m squares around each turbine were also treated in the same way to give a more focused assessment of the peat immediately associated with each turbine

AGEC's 200 m x 200 m T-cells, with a single turbine at the centre of each, have formed the basis of most site-wide assessments of stability and peatslide risk ever since. The key susceptibility map presented within the

rEIAS *"based on site conditions in 1998"* ('*Figure 10-34, rEIAS*') uses the same T-cells developed by AGEC for their 2004 report.

AGEC (2004) used the recorded shear vane values together with measured values for peat depth and slope angle to calculate a Factor of Safety value for each of the 71 T-cells. Where no shear vane value was available, a strength value of 4 kPa was used. The same value was used where there was evidence of instability. These FoS calculations were based for each T-cell on a single shear vane sampling location using the very small 25mm hand-operated shear vane and in some instances a single location for a somewhat larger 55 mm mechanical shear vane.

'*Section 10.5.1, Appendix A*" states that over 250 shear vane tests were carried out *"across the site"*, but in fact only 50 of the 71 T-cells were tested. The statement that *"over 250 shear vane tests"* were carried out refers to the fact that values were obtained from different depths in the peat at most of these 50 locations ('*Appendix D of Appendix A*'). Thus while peat strength values were obtained for 50 of the T-cells, no values were obtained for 21 squares (30% of the site). Instead, strength values were merely estimated for these 21 squares when assessing Factor of Safety values ('*Appendix D of Appendix A*').

As discussed earlier, a FoS of 1 is considered to be the point of failure, so in accordance with general practice AGEC (2004) chose 1.4 as the threshold for acceptable stability. On the basis of the calculated FoS values, AGEC (2004) concluded that only four of the T-cells had FoS values less than this threshold.

AGEC (2005) then took the lowest recorded strength value (2.8 kPa obtained from T-cell 34) and added a theoretical load in order to test the effect of a hypothetical weak zone within the peat (though perhaps in reality it was not so hypothetical). This resulted in 31 of the 71 T-cells achieving a FoS value less than the designated safety threshold of 1.4. AGEC (2004) concluded that because some of these T-cells already had constructed roads and turbines, the hypothetical model they had used was too cautious.

Three points are worth making about this AGEC (2004) analysis. Firstly, a very small-bladed shear vane was used, so with adjustments for the errors arising from such a device highlighted by Long (2005) and Long and Boylan (2012), using a shear strength of 2.8 kPa may have been closer to reality than was appreciated by AGEC.

Secondly, the FoS calculation for each T-cell was based on testing the peat in only a single location in each T-cell, and even this in only a proportion of the full set of T-cells (see Figure 6).

The degree of extrapolation from one sample location across an area of 200 m x 200 m, and then extrapolating across to other cells, represents a considerable act of faith. In a great many ways it does not conform to the guidance provided in SGG-2017. Of course the AGEC work was completed some 13 years before the SGG-2017 guidance was published, but the seminal Landva (1980) paper had been available for more than 20 years prior to start of the AGEC investigation. Its implications should have been clear and taken into account.

Finally, this assessment was based solely on FoS calculations derived from partial shear vane, peat depth data and slope. It did use signs of instability (tension cracks) to decide on the use of a minimum shear strength for the FoS calculation in some locations, but there are several areas where it cannot be said to have met the criteria set out in the later SGG-2017 guidance. It is therefore a valuable initial, if partial, indication of those areas meriting further investigation – albeit couched in wording which speaks of 'hypothetical' conditions which are described as 'unrealistic'.

There is little indication that the AGEC (2004) findings, albeit from what is described as an 'unrealistic hypothetical' case, were used to guide further consideration of risk. The risk assessment presented in the rEIAS is instead based on the much larger dataset provided by ESBI (2005) and now presented in '*Appendix XIV (Vols. 1 and 2) of Appendix D of Appendix B*'. This represents the only additional site-wide data currently available. There has been no extensive survey since that time, and even the data collected in 2004 and 2005 cannot be described as comprehensively site-wide. Significant areas of the site remain largely un-tested even today, despite indications that critical factors may be at play in these areas. For example, although '*Appendix XIV of Appendix D of Appendix B*' states that 1179 shear vane tests were carried out across the site, when the distribution of these tests is examined (see Figure 7) it becomes evident that many of AGEC's T-cells still either have no shear vane sample or at most only one or two.

The risk assessment offered in '*rEIAS, Section 10.2.4.4 and Figures 10-34, 10-35, 10-36*' is thus based on a synthesis of the data gathered some 16 years ago in 2004/5 across only parts of the site and is essentially a re-working of this information into a risk assessment.

Figure 6. The 71 'T-cells' created by AGEC (2004). Each 200 m x 200 m cell is centred on a numbered turbine. Coloured shading indicates those cells with calculated Factor of Safety values less than 1.4, based on a hypothetical load of 10 kPA (equivalent to 1 m depth of excavated peat) and a weak layer within the peat (see Section 10.7, AGEC, 2004). Black circles indicate AGEC shear vane measurements. Note that the northern area of the windfarm in particular has few actual shear vane measurements yet parts are still indicated as at maximum risk under this scenario. The zone around T68 from where the 2003 failure flowed is clearly indicated as a high-risk region.

Figure 7. Distribution of ESBI (2005) shear vane tests across the T-cells of the windfarm site (from '*Figure 2, Appendix XIV of Appendix D of Appendix B*'). There is little coverage in the eastern part of the site, while certain T-cells in critical areas (e.g. T-cells 2, 18, 47 and 52) have only one or two testing locations.

6.2 Assessing adverse consequences and determining risk

6.2.1 SGG-2017 – risk assessment

The SGG-2017 guidance acknowledges that there is no single agreed method for assessing hazard and risk associated with peat landslides. Instead it highlights certain key issues that any method must address. It states:

"The probability of a peat landslide reflects the combined influences of *preconditions, preparatory factors and triggering factors, or collective 'controls', on the stability of a peat deposit.*

The addition of man-made controls (such as construction activities, alterations to peat drainage) reflects the potential destabilising effects of human activity on peatlands, and evidence from well-publicised peat landslide events that human activity may exert a significant control on peat stability (e.g. Lindsay & Bragg, 2005; Dykes and Warburton, 2007a).

As part of the EIA submission, it is expected that the [Peat Landslide Hazard Risk Assessment] provides sufficient estimates of risks to enable infrastructure layout (e.g. turbines, hard standings, compounds, tracks) to avoid areas of medium or high risk, while also making full and detailed recommendations for mitigation of low and medium risks where exposure remains."

6.2.2 rEIAS – risk assessment

The risk assessment process employed by the rEIAS is not described at all in '*rEIAS, Section 10.2.4. – Baseline Peat Stability Risk Assessment*'. Only the final resulting assessments are presented there, with assessments for three time-periods spanning the life of the development. Details of the assessment process are instead given in '*Sections 1, 2.5, 3.4 and 5.6 Appendix B*', where various relevant factors are considered and evaluated in '*Tables 2-2, 3-5 and 5-4, Appendix B*'.

The following factors are considered in '*Tables 2-2, 3-5 and 5-4, Appendix B*':

- Condition of the peat and/or sub-soil;
- Topography;
- Hydrology
- FoS;
- Contributory factors.

These factors are given numerical values between 5 and 20 in steps of 5 for each T-cell, though some factors are in effect allocated a 'Present' (20) – 'Absent' (5) option.

Although never specifically referred to, it seems that '*Tables B1 to B5, Appendix B of Appendix B*' are the source of these values.

The decision to allocate four categories to some of these factors but to allocate a simple 'Present' – 'Absent' option to others is a matter of expert judgement, as is the decision concerning which aspects of each factor are used to assign a particular condition to a particular category. Thus, for example, in '*Table B1*' the factor '*Stability of peat in trial pits*' allocates '*Collapse at >3m depth*' as '*Medium*' (Score 15), but '*Collapse at <3m depth*' as '*High*' (Score 20). However, collapse at any depth should be cause for serious concern, so the logic of separation is not clear.

In similar vein, '*Table B3*' allocates only those Factor of Safety values less than 1 to the highest category. It allows FoS values below the AGEC threshold of 1.4 to be allocated to a '*Low*' rating. The issues of poor shear vane recording and consequent impact on FoS values has been discussed earlier in the present document, and the rEIAS must surely be aware of the widespread concerns about such field data (given that the rEIAS states that it is using the SGG-2017 as its guidance). The categorisation of values even at the AGEC threshold of 1.4 as 'Low' would appear to be an inappropriate decision and not one guided by the required degree of caution.

Impact

At least in terms of 'Impact', given that the 2003 peatslide caused very considerable impact (and indeed continues to do so in terms of financial consequences) it is appropriate that '*Tables 2-2, 3-5 and 5-4, Appendix B*' have allocated the maximum possible Impact value to every T-cell.

Risk assessment mapping

Based on these data and decision-steps, three scenarios are then presented in '*Appendix B*' and repeated in '*Section 10.2.4.4*' of the rEIAS:

- the risk in 1998 prior to commencing windfarm construction ('*Section 2.5 with Figure 2-17 and Table 2-2, Appendix B*');
- the risk following mitigation and improved site conditions for the period 2005 to 2020 ('*Section 3.4 with Figure 3-39 and Table 3-5, Appendix B*'); and
- the risk following mitigation and improved site conditions from 2020 to decommissioning in 2040 ('*Section 5.6 with Figure 5-8 and Table 5-4, Appendix B*').

The first scenario, presented as the 'baseline' condition in 1998, generates a peatslide risk map which identifies a considerable number of T-cells having

significant risk of instability and consequent impact (see Figure 8). The distribution of shear vane tests in relation to this assessment can be seen in Figure 9, while correspondence with the original 'worst-case' map generated by AGEC (2004) can be seen in Figure 10.

What is most striking about the areas identified as being at risk in by AGL (2020) is the clear concentration of T-cells at risk in the northern sector of the site, mirroring the already-failed area of the 2003 slide to the south. This region remained largely un-surveyed by AGEC (2004) so the main records for peat condition come from ESBI (2005). Even after this survey, however, some critical T-cells remain largely un-tested, as can be seen from Figure 9. They still emerge as being significantly at risk because of other risk factors. Concentration of high-risk areas in the northern and western parts of the site is reinforced by the findings of the AGEC (2004) report, as can be seen in Figure 10.

There are, nevertheless, doubts about the underlying data, as well as about the calculations and the classifications used in assembling the risk assessment presented in the rEIAS. The list of aspects that do not conform to, or adequately respond to, the various guidance steps set out in SGG-2017 includes:

- incomplete survey of the site;
- reliance on shear vane data;
- no adjustment for, or consideration of, shear vane blade size;
- inconsistent or incomplete mapping of surface and sub-surface seepage zones;
- little evidence for attempts to map sub-surface piping;
- failure to map forestry plough lines;
- failure to map fissures associated with forestry plough lines.

There is also a degree of uncertainty about several of the key data items recorded on the T-cell field sheets presented in '*Appendix B of Appendix B*' because they consistently have asterisks beside them, together with an asterisk key stating: "*Assumed, no information available, therefore, data conservatively assumed based on general on-site experience.*" Precisely which data items this comment refers to is not made clear but the comment appears on every record form. It is to be hoped that all these asterisked items have not been universally "*...assumed based on general on-site experience*" as this would represent a very large component of the data reportedly collected.

Figure 8. Peat Stability Assessment by AGL (2020) for baseline conditions in 1998 for each T-cell. Highest risk rating is '5'. Note the concentration of high risk cells in the northern section of the site, and also the high risk value along the western margin of the site.

Figure 9. Peat Stability Assessment by AGL (2020) for baseline conditions in 1998 for each T-cell (highest risk rating is '5'), together with locations of shear vane sampling by ESBI in 2004/2005. Note the limited number of samples in high-risk cells 47 and 52, as well as the limited sampling in the SW corner of the site, and the absence of sampling for T-cell 46.

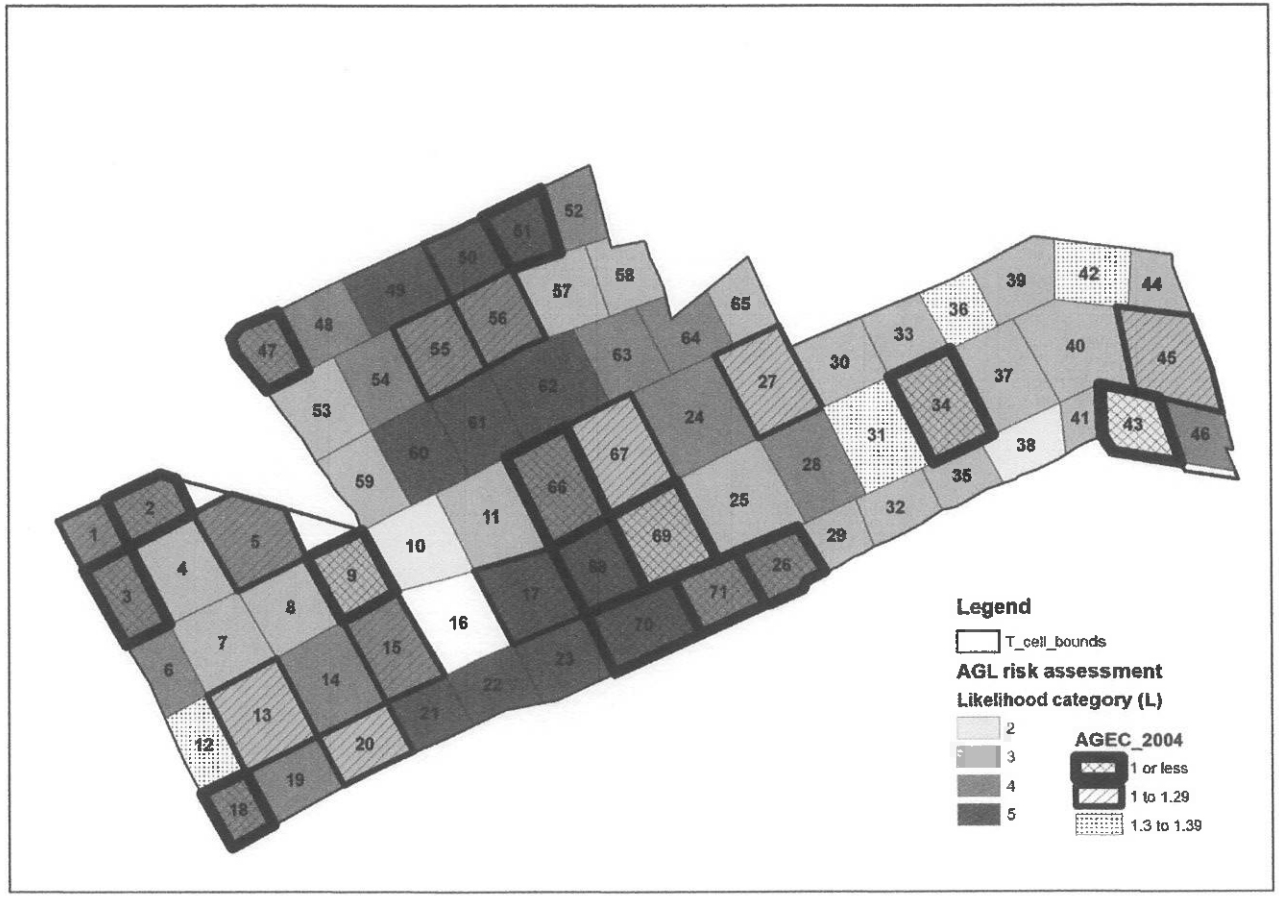

Figure 10. Peat Stability Assessment by AGL (2020) for baseline conditions in 1998 for each T-cell (highest risk rating is '5'), together with 'hypothetical' risk assessment by AGEC (2004). Note correspondence of the two assessments for western T-cells 2, 3 and18, and northern T-cells 47, 50, 51, 55 and 56.

Notwithstanding this uncertainty about the field sheets, it is possible to assemble a set of criteria from these sheets which arguably more closely reflect the guidance provided in SGG-2017 as well as those features highlighted by Dykes (2008) and presented in Table 1 earlier. This revised working of the ESBI T-cell field sheets is shown in Table 3.

Figure 11 compares the distribution of T-cells at risk based on the data in Table 3 with the distribution of at-risk T-cells presented by the rIEAS (and shown in Figure 8 above). From this it can be seen that there is good correspondence across all those T-cells identified in the rEIAS, but the revised assessment based on the data in Table 3 highlights a number of additional T-cells.

While the foregoing is all based on data from which predictions are made, it is also possible to correlate actual examples of failure with these values of risk assessment. Most evidently, the area of the 2003 peatslide features prominently in all these predicted assessments not because of the slide but because the character of the ground points to potential instability. Similarly, T-cell 31 within the turbary plots features consistently within these assessments and this is the location of the peat failure illustrated in '*rEIAS, Section 10.4.5.2.3, Plate 10-8*'.

Furthermore, in a very recent development, the developers have erected a 'Hazard' sign at the entrance to the turbary area stating that there is a risk of instability if peat extraction operations are undertaken. Although '*rEIAS, Section 10.4.5.2.3*' states "*The peat slide was not caused by site activities related to the construction or operation of the windfarm*," the rEIAS and indeed field sheets presented as 'rEIAS, Appendix B of Appendix B' highlight the presence of sub-surface seepage running through the turbary area to the head of the turbary peatslide.

The start of this sub-surface seepage sits at a confluence of windfarm and forestry drainage infrastructure at Turbine 27, as can be seen from '*rEIAS, Drawing No. 11-147-03, Appendix B of Appendix B*', from where water is fed SE into the drainage system that runs alongside the road between Turbine 25 and Turbine 40 to the east. Interconnection with the very obvious seepage zone running from Turbine T27 to the peat slide, either directly at T27 or where the road drainage crosses the seepage zone immediately to the east of Turbine 34, could quite conceivably led a build-up of hydrostatic pressure within the seepage zone, causing failure. This possibility is discounted by the rEIAS without evidence, yet if pietzometers had been spread along the turbary zone rather than being clustered round a single turbine, and had those piezometers been maintained rather than being decommissioned, perhaps such dismissal of possibilities would have been tenable – or may have revealed a developing issue. As it is, the appearance of a 'Hazard' sign suggests that stability conditions on the site in 2020 are not as suggested by '*rEIAS, Figure 10-36*'.

In addition, deterioration or failure of the roadway in various locations has necessitated remedial action. In the case of the roadway between Turbines 15 and 17 a decision was even made to abandon the road because ground conditions were so unstable.

By overlaying the map of road sections which by 2014 required remedial action shows close correspondence with the high-risk T-cells consistently identified by the risk assessments. The northern section of the site has required remedial action along substantial sections of roadway, while in addition to the section in the south-west which has been abandoned (and for which data are not supplied as part of the rEIAS) it can be seen that several other significant portions of road in the western part of the site have required remedial action.

Furthermore, '*Figure 3-7, Appendix B*' indicates several areas where forestry will be left in place despite the general requirement for forestry to be removed when a windfarm is constructed. No reason is given for the retention of these forest blocks but their somewhat irregular edges suggest that they have been left in place because of local ground conditions rather than being planned forest coups. Their concentration in the northern part of the site, across areas consistently indicated as being at risk, would lend weight to the conclusion that this ground has shown sufficient signs of instability to abandon forest operations.

Sufficient evidence thus exists of ongoing instability in those areas consistently highlighted as being at risk to make a compelling case for a re-survey of the site, similar to that undertaken in 2004/2005. There has been ample opportunity to acknowledge the need for, and to undertake, further survey, given that all current risk assessments are based on data obtained as much as 20 years ago. However, no such fresh survey data, particularly for those areas potentially at risk, are presented within the rEIAS.

Recent survey has instead focused on the area of the 2003 peatslide or the peat repository areas. Given that much of the original peat has already been lost from the peatslide area, the main threat from this ground is most likely to be the formation of peat 'plates (like mud-cracks) on areas of bare peat. These plates form during dry weather but are then are lifted and transported downstream during periods of heavy rainfall (Hulme & Blyth, 1985). Consequent increases in levels of particulate organic carbon (POC) and dissolved organic carbon (DOC) will have a negative impact on downstream water quality whenever this occurs.

The peat repository areas, meanwhile, are held within constructed barrages which have been subject to recent geotechnical testing – unlike the remainder of the site.

Table 3. T-cells ordered according to the number of criteria met, based on peatslope risk assessment criteria recommended in SGG-2017.

T-cell	von Post	Pit stability	Convex break	Cu 2.5 kPa	Cu 2.5 class	Surface water	Forestry	Seepage	Pipes	Cracks	Valley	No. of criteria met
68	H8-H10	Local collapse	Yes	1	4	Y	Y	Y	Y	Y	Y	9
2	H8-H10	Spalling	Yes	<1 to <1.3	3	Y	Y	Y	Y	N	Y	8
4	H8-H10	Local collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
14	H8-H10	Collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
17	H8-H10	Collapse	Yes	>1.3	1	Y	Y	Y	Y	Y	Y	8
49	H5-H10	Collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
50	H6	Collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
53	H5-H10	Local collapse	Yes	<1	5	Y	Y	Y	Y	N	N	8
60	H5-H10	Collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
61	H5-H10	Local collapse	Yes	1	4	Y	Y	Y	N	Y	Y	8
62	H8-H10	Local collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
69	H8-H10	Local collapse	Yes	<1	5	Y	Y	Y	N	N	Y	8
3	H8-H10	Local collapse	Yes	<1	5	Y	Y	Y	N	N	N	7
5	H5-H10	Local collapse	Yes	<1 to <1.3	3	Y	Y	Y	N	N	Y	7
13	H8-H10	Collapse	Yes	1	4	Y	Y	Y	N	N	Y	7
15	H8-H10	Collapse	Yes	1	4	Y	Y	Y	N	N	Y	7
19	H6	Local collapse	Yes	<1 to <1.3	3	Y	Y	Y	N	N	Y	7

T-cell	von Post	Pit stability	Convex break	Cu 2.5 kPa	Cu 2.5 class	Surface water	Forestry	Seepage	Pipes	Cracks	Valley	No. of criteria met
20	H5-H10	Spalling	Yes	<1 to <1.3	3	Y	Y	Y	Y	N	N	7
21	H5-H10	Spalling	Yes	<1 to <1.3	3	Y	Y	Y	Y	N	N	7
31	H9	Local collapse	Yes	<1	5	Y	N	Y	Y	N	N	7
47	H9	Spalling	Yes	1	4	Y	Y	Y	N	N	Y	7
51	H5-H10	Local collapse	Yes	<1	5	Y	N	Y	N	N	Y	7
54	H9	Collapse	Yes	<1	5	Y	Y	Y	N	N	N	7
55	H9	Local collapse	Yes	<1	5	Y	Y	Y	N	N	N	7
59	H9	Spalling	Yes	<1 to <1.3	3	Y	Y	Y	Y	N	N	7
63	H5-H7	Spalling	Yes	<1	5	Y	Y	Y	N	N	N	7
64	H5-H10	Local collapse	Yes	<1	5	Y	Y	Y	N	N	N	7
1	H8-H10	Spalling	Yes	<1 to <1.3	3	Y	Y	Y	N	N	N	6
8	H8-H10	Collapse	Yes	<1 to <1.3	3	Y	Y	Y	N	N	N	6
12	H5-H10	Local collapse	Yes	<1 to <1.3	3	Y	Y	Y	N	N	N	6
22	H5-H10	Spalling	No	<1	5	N	Y	N	Y	N	Y	6
27	H8-H10	Collapse	No	<1	5	Y	N	Y	Y	N	N	6
33	H9	Collapse	No	<1	5	Y	N	Y	Y	N	N	6
34	H5-H7	OK	Yes	1	4	Y	N	Y	Y	N	Y	6
36	H5-H10	Local collapse	Yes	1	4	Y	N	Y	Y	N	N	6

T-cell	von Post	Pit stability	Convex break	Cu 2.5 kPa	Cu 2.5 class	Surface water	Forestry	Seepage	Pipes	Cracks	Valley	No. of criteria met
48	H5-H10	Local collapse	Yes	<1 to <1.3	3	Y	Y	Y	N	N	N	6
65	H8-H10	Spalling	Yes	1	4	Y	Y	Y	N	N	N	6
66	H8-H10	Spalling	No	1	4	Y	Y	Y	N	N	Y	6
70	H5-H10	OK	No	>1.3	1	N	Y	N	Y	Y	Y	6
6	H5-H10		Yes	<1 to <1.3	3	Y	Y	Y	N	N	N	5
7	H8-H10	Collapse	No	<1 to <1.3	3	Y	Y	Y	N	N	N	5
9	H8-H10	Collapse	Yes	>1	2	Y	Y	Y	N	N	N	5
18	H6	Spalling	Yes	>1.3	1	Y	Y	Y	N	N	N	5
44	H8-H10	Spalling	Yes	1	4	Y	N	Y	N	N	N	5
56	H6	Spalling	No	<1	5	Y	N	Y	N	N	N	5
67	h5-h10	OK	Yes	>1.3	1	Y	Y	Y	N	N	Y	5
11	H5-H10	Spalling	No	>1.3	1	N	Y	N	Y	N	Y	4
24	H6	OK	Yes	>1.3	1	Y	Y	Y	N	N	N	4
30	H5-H10	Local collapse	No	>1.3	1	Y	N	Y	Y	N	N	4
45	H6	OK	Yes	>1.3	1	Y	N	N	Y	N	N	4
57	H6	OK	Yes	>1.3	1	Y	Y	Y	N	N	N	4
23	H6	OK	No	>1.3	1	N	Y	N	Y	N	Y	3
28	H6	OK	Yes	1	4	N	N	N	Y	N	N	3

T-cell	von Post	Pit stability	Convex break	Cu 2.5 kPa	Cu 2.5 class	Surface water	Forestry	Seepage	Pipes	Cracks	Valley	No. of criteria met
39	H5-H10	Spalling	Yes	1	4	N	N	N	N	N	N	3
42	H8-H10	Spalling	Yes	>1.3	1	N	N	N	Y	N	N	3
25	H6	OK	Yes	>1.3	1	N	Y	N	N	N	N	2
26	H5-H10	OK	No	<1 to <1.3	3	N	Y	N	N	N	N	2
29	H6	OK	No	>1.3	1	N	Y	N	N	N	Y	2
32	H6	OK	No	>1.3	1	N	Y	N	Y	N	N	2
37	H6	OK	Yes	>1.3	1	N	N	N	Y	N	N	2
38	H6	OK	No	>1.3	1	N	Y	N	Y	N	N	2
41	H6	OK	No	>1.3	1	N	Y	N	Y	N	N	2
71	H5-H10	OK	No	1	4	N	Y	N	N	N	N	2
10	H5-H7	OK	No	>1.3	1	N	Y	N	N	N	N	1
35	H5-H7	OK	No	>1.3	1	N	N	N	Y	N	N	1
40	H6	OK	Yes	>1.3	1	N	N	N	N	N	N	1
43	H6	OK	Yes	>1.3	1	N	N	N	N	N	N	1
46	H6	OK	Yes	>1.3	1	N	N	N	N	N	N	1
58	H6	OK	No	>1.3	1	N	Y	N	N	N	N	1
52	H6	OK	No	>1.3	1	N	N	N	N	N	N	0

Figure 11. Correspondence between criteria set out in Table 3 and AGL risk assessment. Note in particular the consistent emphasis on the northern and western sectorsr of the site. Note that T-cells 14 and 15 represent the most extensive area of deep peat on the site, and this SW corner of the site slopes in the direction of the village of Derrybrien.

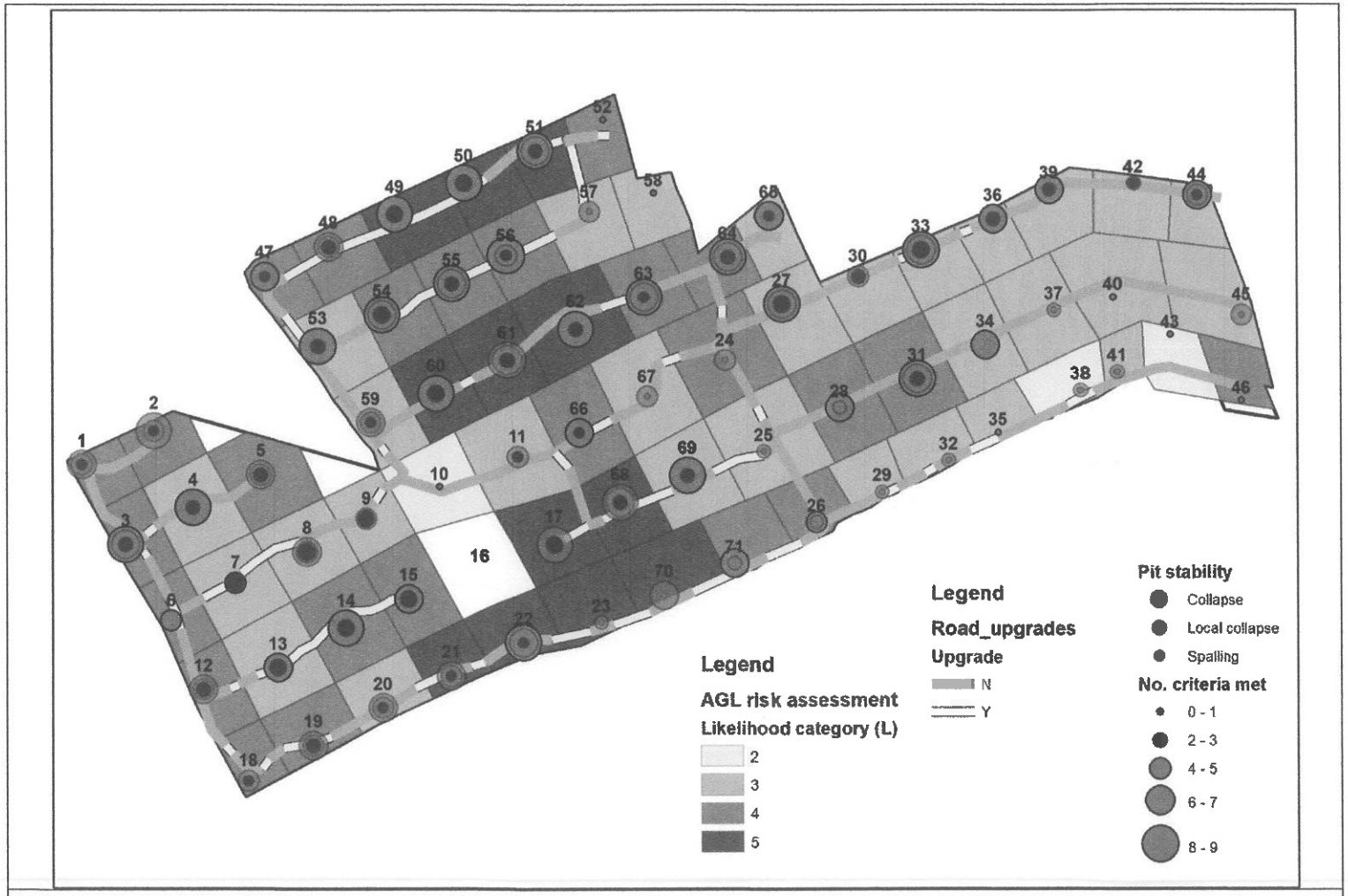

Figure 12. Map of road system indicating (in red) sections requiring remedial action in 2014. Correspondence between identified peatslide risk. The need for remedial action (in addition to the zone of the 2003 peatslide) is particularly marked in northern and western sections of the site. Road upgrade map from '*Drawing P378015-C-0003, Appendix A of Appendix B*'.

7. Mitigation

In some ways this is the most critical aspect of the rEIAS because, as the foregoing demonstrates, within its risk assessment the rEIAS recognises that a good proportion of the T-cells within the windfarm development are potentially at risk. The proposed mitigation measures are then claimed to alter conditions to such an extent that all at-risk T-cells are converted to a negligible-risk rating by 2020.

7.1 Mitigating actions

7.1.1 SGG-2017 – Mitigation

The SGG-2017 guidance provides four main actions and four sub-theme actions which can be used to reduce the likelihood of peat-slope failure:

- Avoidance;
- Engineering measures to minimise landslide risk;
- Engineering measures to control landslide impacts;
- Monitoring and review.

7.1.1.1 Avoidance

SGG-2017 guidance states that areas displaying Medium or High risk levels should be avoided. Infrastructure should be relocated to areas of lower risk. If avoidance is not possible, engineering measures should be put in place to minimise or control any risk.

7.1.1.2 Engineering measures to minimise risk

Although the SGG-2017 guidance identifies **drainage** measures as one approach to minimising risk, it employs drainage in a very specific way – namely as a means of re-routing surface and sub-surface water flows away from high-risk areas. The SGG-2017 guidance does *not* encourage the use of drainage as a general means of drying out the peat matrix in order to increase its shear strength.

In terms of **construction management**, the SGG-2017 guidance makes clear the importance of establishing rigorous procedures for managing actions in at-risk areas. It also emphasises the need to avoid loading excavated peat onto intact peat wherever possible.

7.1.1.3 Engineering measures to control landslide impacts

The SGG-2017 guidance does not seek to be prescriptive about measures which might be used to control the impact of any slope failure which might occur. This is because new approaches are constantly being explored and developed, particularly within the field of peatland habitat restoration where

such measures may be useful for restoration but may also have a role to play in controlling impact should slope failure occur.

The guidance does, however, identify two measures which are already well-established, namely **catch-wall fences** and **catch ditches**. Both are designed to slow or halt any run-out that may occur, with the former engineered into the peat substrate whereas the latter should be cut into non-peat soils rather than into the peat itself.

7.1.1.4 **Monitoring and review**

The SGG-2017 guidance states that factors affecting *"...the likelihood of peat landslides and their consequences may change with time. Thus, ongoing review of the peat hazard management plan is essential."*

7.1.2 rEIAS – Mitigation and monitoring

7.1.2.1 **Scope of rEIAS mitigation measures**

Although *'rEIAS, Section 10.5'* is titled *'Remedial (Mitigation) Measures and Monitoring'*, the majority of the section is devoted to measures designed to minimise further impact. It provides relatively little information about remedial actions designed to reduce *existing* risk. The focus is almost entirely devoted to direct impacts caused by site infrastructure or by removal of forest blocks. This restricted focus does not therefore tally with the approach adopted to risk assessment whereby the *entire* site is divided into contiguous T-cells with a risk assessment then generated for each of these cells.

Careful reading of *'rEIAS, Section 10.5'* reveals that actual mitigation measures undertaken to reduce existing risk created by the presence of the windfarm or risk inherent in site conditions, consist of just three actions or processes:

- Consolidation of peat beneath the roads, thereby increasing shear strength of the peat directly under the roads through compression;
- Abandonment of Turbine 16 and its section of access road;
- Improving and maintaining drainage across the site.

Two of these steps (consolidation of the peat beneath roads, and abandonment of T16) do indeed represent actions that almost certainly have reduced existing risk. The last action, that of site-wide drainage, creates more long-term challenges than it solves.

7.1.2.2 **Engineering measures to minimise risk**

The claimed and predicted mitigation improvement in conditions shown in the sequence '*rEIAS, Figures 10-34, 10-35 and 10-36*' is derived from the risk assessment set out in '*rEIAS, Appendix B*'. Of particular relevance are '*Tables 3-3, 3-5, 4-3 and 5-4 of Appendix B*'. These tables contain revised 'Hazard likelihood' values which are then used together with 'Impact' to derive new 'Risk Ratings'. '*Table 3-5 of Appendix B*' gives expert-judgement values for factors influencing site conditions *prior* to 2003 and these values are then used to calculate a 'Total Hazard Rating' then used to derive a 'Hazard Likelihood' value. No such expert judgement values for these factors are provided in '*Table 3-5 of Appendix B*' for the predicted post-mitigation conditions in 2004-2005. A 'Hazard Likelihood' value is simply presented and appears to be based on the decision that any 'Hazard Likelihood' value of greater than 3 in 1998 now reduces universally to a 'Hazard Likelihood' value of 2, while values originally set at 3 or less can be universally reduced to a 'Hazard Likelihood' value of 1.

The quantified logic behind this change in 'Hazard Likelihood' values is not explained. Given that, for example, the condition-factors 'Peat' or 'Topography' cannot readily be altered by mitigation other than by wholesale movement of windfarm infrastructure, such wholesale transformation is also difficult to understand. It might be argued that '*Table 3-3, Appendix B*' provides a basis for revision of the condition-factor values but there is no attempt to relate what is in '*Table 3-3, Appendix B*' either to the individual site-condition factors (such as Topography) used in '*Table 3-5, Appendix B*' for baseline 1998 conditions, nor indeed even directly to the new 'Hazard Likelihood' value given (without calculated explanation) for conditions after 2004-2005 mitigation works.

Drainage consolidates but also dislocates

The perception that mitigation actions applicable to mineral soils are equally applicable to peat soils is captured very clearly in the belief repeatedly expressed in '*rEIAS, Section 10.5*' that drainage will be wholly positive and inevitably increase slope stability. Unfortunately this is not the case, as has been described and illustrated earlier in the present document. The degree of shrinkage in peat soils following drainage can be an order of magnitude greater than that normally encountered in a mineral soil. This means that the unconfined peat matrix (i.e. peat not confined beneath a 'floating road') *must* crack and fissure under such drainage forces because it cannot occupy the same volume as it did when much of its volume consisted of stored water.

As discussed and illustrated earlier in the present document, while individual blocks of peat may gain in shear strength if they lose water to drainage systems, the drains themselves represent lines of zero cohesion, and as cracks develop in the peat these multiply the regions having zero cohesion.

Where deformation due to drying also results in separation along a line of weakness within the peat or separation of the peat from the mineral sub-soil, this provides avenues for water to increase hydrostatic pressure within or beneath the peat and also to lubricate the junction between these layers.

Drainage and maintenance of the peat in a robustly drained state throughout the life of the windfarm is regarded as a consistently positive mitigation measure by the rEIAS. This is based solely on the belief that the critical features for risk assessment are the roads and other infrastructure. While it is true that a waterlogged road is a danger to the stability of heavy vehicles and a waterlogged turbine base is a danger to turbine stability, almost no thought appears to have been given to the long-term consequences of drainage on the peat surrounding this infrastructure.

7.1.2.3 Engineering measures to control impact

Although the AGEC (2004) report recommends that a Contingency Plan be drawn up to control the impacts of any subsequent slope failure (following the 2003 failure), there is no evidence from the rEIAS or associated documents that such measures have been drawn up for the four catchments identified in '*Drawing No. QS-000192-01-D451-018, Appendix A of Appendix B*'.

7.1.2.4 Monitoring

It has already been pointed out in Section 5.4.2 above that the only continuous monitoring devices installed on the site (piezometers and tilt-meters) were decommissioned in 2014. Since then, the sole monitoring devices have been a set of 'sighting poles' located in the 2003 peatslide area which are checked intermittently by eye for signs of movement.

'*Section 10.5.4.2*' of the rEIAS and '*Table 3.2, Appendix C*' list a set of Periodic Inspection Reports undertaken by ESB, while *Table 4-2, Appendix B*' list a set of Geotechnical Inspection Reports undertaken by ESBI, together covering the period 2006 to 201, no example of these reports is provided as part of the rEIAS submission. The only description of what is monitored for these inspections is found in '*Section 3.2, Appendix C*' which notes that a report produced by ESB (2006) makes recommendations for a monitoring programme. '*Section 3.2, Appendix C*' simply lists the following as aspects which are the focus of such inspections:

- Peat slide source area;
- Repository areas;
- Containment barrages;
- Drainage network;
- Site access roads;

- Drainage local to turbines and associated hardstands;
- Borrow pits;
- Sighting posts and remote monitoring instrumentation (now decommissioned).

No details of what is monitored nor how it is monitored are provided.

However, a 2005 draft copy of the ESBI (2006) report – not supplied as part of the rEIAS submission – recommends the following inspection methodology:

Weekly

- Weekly check of remote monitoring instrumentation (now of course decommissioned);

Monthly – to confirm

- that the drainage network is operating freely;
- that there is no standing water adjacent to roads or turbine bases;
- that silt traps are not choked;
- no evidence of unusual road movement or of cracking;
- no un-intentional loading of the peat;
- no movement in the peat repository areas;
- the barrages are permitting free flow of the watercourse;
- the peatslide debris is stable
- any relevant off-site activities.

Yearly – by a geotechnical engineer and surveyor

- review effectiveness of drainage network;
- review shallow valleys on site for signs of movement;
- review 'restricted areas' (e.g.. areas where trees were not removed) for signs of movement;
- review the main slide area to check for movement and re-vegetation;
- review stability of borrow pits;
- review the barrages;
- review the remote monitoring instrumentation (now decommissioned).

Assuming that this monitoring regime was adopted and has been continuing since 2006 (and there is no way of knowing from the rEIAS submission whether this does now represent the regular monitoring programme), it is evident that monitoring since 2006 has relied on periodic inspection by eye

alone, and only the annual inspection requires the eye of a qualified specialist.

No formal testing of ground conditions is required in this regime, and the only monitoring instrumentation referred to has been decommissioned since 2014. Given that 16 years have passed since collection of the data on which the AGL (2020) risk assessment was based, and three years since publication of SGG-2017, there has been ample time for additional data to have been gathered both to confirm the changes in site condition assumed in the AGL (2020) risk assessment and also gather data which are more appropriate to a risk assessment claiming to conform to the requirements of SGG-2017. It appears from the rEIAS that the site operators have not made use of this opportunity.

8. Post-construction and restoration works

8.1 SGG-17 – Post-construction work

The SGG-2017 guidance emphasises that risk exists throughout the lifetime of the development and beyond. Restoration works bring their own risks if undertaken inappropriately. Equally, further risks to stability can also arise through the absence of restoration work at the end of the development lifetime, with the site simply left to respond to the long-term impacts of the development.

The SGG-2017 guidance highlights the importance of considerations and actions during the post-construction and restoration phase of the development. It states: *"Restoration proposals should aim to restore the water table of the peatland to ensure that the peatland becomes active again and therefore stores carbon. Otherwise, potentially significant changes to the hydrology of the peat bog may result in irreversible changes to the physical characteristics and structure of the peat that could both increase the likelihood of peat landslides and lead to long term degradation of the peat resource."*

8.2 rEIAS – Post construction work

The description of decommissioning provided by the rEIAS ('*Section 10.3.2.3.2*' and '*Section 10.7*') makes clear that the drainage system will be left to choke up after the above-ground infrastructure is removed: *"The improved drainage network on the wind farm site will be maintained up to decommissioning so that it will continue to have a positive impact with a moderately significant impact on the peat relative to the baseline conditions prior to construction. However, over time the drains will become clogged with vegetation which will result in partial restoration of groundwater levels on the site. In the long term this will reduce the effect on the stability of the peat to slightly significant."* (p.'*10-337*')

This statement appears remarkably sanguine about such an eventuality, given that the whole preceding document has repeatedly emphasised the dangers of ponded water and the undesirability of the drainage system choking up.

Damage to peatland systems through drainage cannot be simply undone by 'walking away'. A very considerable sum of money is spent every year across the European Union undoing the damage caused by peatland drainage because re-wetting drained peatland is not simply (or safely) a case of just 'walking away'. As the rEIAS (and a great many specialist geo-engineering authors) repeatedly acknowledge, the failure of an established drainage system on a hill summit characterised by many convex slopes represents a very significant risk of slope failure. Some examples of such failure have resulted from drains or peat cuttings created a great many years prior to the eventual slope-failure event.

Undoing the effects of peatland drainage is generally a more complex challenge than installing drainage in the first place – precisely because of shrinkage, cracking and deformation within the peat. The challenges are increased substantially where forestry has been involved because the tree roots add further complexity while forestry ploughing furrows (with their inevitable cracks) are generally placed at much closer intervals than when draining open landscapes. Research (e.g. Holden et al., 2007) has shown that drains with gradients of more than 4° tend to remain open and erode their bases over time. The general assumption of the rEIAS that all drains will choke up over time is therefore also not valid and not based on available scientific evidence.

Restoration of a blanket bog habitat on a landform such as the Cashlaundrumlahan summit required very careful and well-informed intervention, particularly as the blanket bog is demonstrably riven with fissures resulting from its historical land use for forestry, now combined with the drainage necessary for windfarm construction and maintenance.

The developers cannot on the one hand state that maintenance of a robust drainage system is vital for site stability then state that they intend to walk away from the site and permit the drainage system to fail having undertaken no mitigating management to stabilise such a future scenario. It is absolutely essential for the long-term stability of the site that suitable measures are tested and the best of these measures implemented by the developers *before* they leave the site.

The proposal to leave roads in place means that the excavated roads across thinner areas of peat will represent sharp breaks in cohesion of the peat mantle until such time as they are overgrown and a strong, fibrous mantle of peat has re-established over the carriageway. 'Floating roads', on the other hand, will continue to sink into the peat and form both a band of dense peat running across the line of sub-surface seepage (thus tending to pond water at depth) while also intercepting surface water flow and directing it along the roadway, thereby depriving the peat mantle of surface water downslope from the road. This will continue until the peat beneath the

roadway becomes so compressed that it cannot compress further, but if the peat is deep this may take many decades or even longer. Eventually, if compression ceases, the carriageway can become overgrown by peat-forming vegetation and can begin to re-accumulate sufficient peat to such an extent that accumulation can fill the trench formed by the road, but this is far into the future and far beyond what is currently known about the long-term behaviour of 'floating roads'.

Drains, fissures and road-lines will therefore continue to represent breaks in the cohesion of the peat-covered landscape and thus form points and lines of weakness until such time as a strong, deep surface layer of peat-forming vegetation can re-establish across them

A range of best-practice methods can inform whatever measures might be tested within the windfarm site and its environs. The recently-updated '*Conserving Bogs – The Management Handbook*' (Thom et al. (2020) is a valuable compendium of information. Moors for the Future and the Yorkshire Peat Partnership in England also have very considerable experience in restoration methods appropriate to intensively drained blanket bog, while the RSPB in Scotland now have much experience in the restoration of forested blanket bog. In particular, given the frequency of peatslides in Shetland, Scotland's Peatland Action team has found that old salmon-farm netting can be extremely useful in helping to stabilise otherwise unstable bare peat. This, combined with the standard engineering use of soil nails, might prove a fruitful area of testing for the Derrybrien site operators over the coming 20 years before decommissioning commences.

What is absolutely clear, given the repeated evidence of slope failure both on the site itself, in the surrounding landscape, and across Ireland as a whole, is that some form of suitable restoration intervention will be required on the Derrybrien site prior to completion of decommissioning to ensure long-term stability of the area. Simply walking away is not an option.

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