Cloud Hill Wind Farm

Additional Environmental Information Report

Volume 3 – Technical Appendices

PREPARED FOR

BayWa r.e.

DATE
24 October 2024

REFERENCE
0740609

CONTENTS

LIST OF APPENDICES

APPENDIX 7.1 OUTLINE BEMP

Cloud Hill Wind Farm

Outline Biodiversity Enhancement Management Plan

AEI Technical Appendix 7.1

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CONTENTS

LIST OF TABLES

1 INTRODUCTION

This Outline Biodiversity Enhancement Management Plan (OBEMP) describes the proposed habitat and conservation management measures in relation to Cloud Hill Wind Farm (hereafter referred to as the 'Proposed Development'). This version of the OBEMP has been updated as part of the Cloud Hill Additional Environmental Information (AEI) Report to include the EIA responses provided by NatureScot and the RSPB with regards to ornithology and should be read in conjunction with **Chapter 8, Ornithology of the AEI Report**.

This OBEMP is set out in the following sections:

- Summary of the Ecological and Ornithological Impact Assessments;
- Biodiversity Enhancement Area;
- Aims, objectives and management prescriptions;
- Monitoring; and
- Management and monitoring timetable.

1.1 Target Habitats and Species

The management recommendations within this OBEMP are based on the findings of **Chapter 7: Ecology of the EIA Report** and **Chapter 8 Ornithology of the EIA Report**. The key habitats addressed are Annex I habitats blanket bog and wet modified bog. The key ornithological species are black grouse and wader species (with a focus on curlew). Recommendations are also included to achieve significant biodiversity enhancement at the Site, in line with objectives outlined in National Planning Framework 4 (NPF4) Policy 3[1].

1.2 Finalisation of the BEMP and Reporting

This OBEMP will be refined through the consenting and pre-construction process of the Proposed Development. The final BEMP will confirm the Biodiversity Enhancement Area (BEA), and any management units therein, where the aims, objectives and management prescriptions will apply. The final BEMP will be agreed with Dumfries and Galloway Council in consultation with NatureScot prior to the commencement of construction of the Proposed Development.

A Biodiversity Management Group (BMG) will oversee and monitor the implementation of the agreed OBEMP. The BMG should include representatives from Dumfries and Galloway Council, NatureScot and the wind farm owner.

An annual report will be submitted by the wind farm owner to the BMG, for at least the first 5 years, detailing the tasks (management and monitoring) completed over the last year and those planned for the year ahead. After this time, it may be appropriate to reduce the frequency of the reports to once every five years or as otherwise agreed with the BMG. Any monitoring reports will be issued to the BMG as they are produced.

[1] Scottish Government (2023). National Planning Framework 4. Available at: https://www.gov.scot/publications/national-planning-framework-4/ [Accessed February 2023].

Management prescriptions in the BEMP may be amended in light of monitoring results to ensure progress towards the stated aims of the plan.

2 SUMMARY OF ECOLOGICAL AND ORNITHOLOGICAL IMPACT ASSESSMENTS

2.1 Ecology

The Proposed Development Area is dominated by marshy grassland, with unimproved acid grassland and wet modified bog. Within and around these areas are patches and pockets of other habitat types such as bracken, semi-natural woodland, improved grassland, and blanket bog.

Important ecological features scoped-in to the ecological impact assessment comprise blanket bog, wet modified bog and bats (high collision risk species, including common pipistrelle, soprano pipistrelle, and *Nyctalus* spp.). Potential collision risk impacts to bats during operation would be mitigated in accordance with the proposals detailed in section 7.7.1.2 of Chapter 7: Ecology. The Proposed Development would impact 0.74 ha of blanket bog (direct 0.34 ha and indirect 0.4 ha) and 6.67 ha of wet modified bog (direct 2.63 ha and indirect 4.04 ha). This OBEMP proposes measures to compensate for the impact on blanket bog and wet modified bog habitats.

2.2 Ornithology

During the ornithology baseline surveys, black grouse were recorded and identified to be lekking at one location (four males, one occasion) on the Site in June 2019 (665 m from the nearest turbine, Figure 8.5).

Waders, including curlew and lapwing, were recorded during the baseline breeding season surveys, with curlew recorded regularly across the Site, and lapwing record within the north-east extent only (Figure 8.14). Curlew and lapwing, now Red Listed species, are considered to be highly sensitive to disturbance (Goodship and Furness *et al* (2022)[2].

Important ornithological features scoped-in to the ornithological impact assessment comprise black grouse, curlew and lapwing. Potential displacement of black grouse lekking or foraging would be mitigated by targeted pre-construction surveys to identify up to date lek areas within 750 m of construction activity immediately prior to construction commencing and specific construction control measures implemented to minimise disturbance for any leks within this area. Potential displacement of waders during construction would be mitigated by a Bird Protection Plan (BPP). Habitat management via the BEMP is proposed to mitigate potential effects of displacement of black grouse and wader species during operation of the wind farm.

3 BIODIVERSITY ENHANCEMENT AREA

The OBEMP proposes a BEA comprising two Management Units (Units A and B) (Figure 7.11) within which management and monitoring works would be implemented.

The BEA covers a total area of 418.2 ha. Details of each management unit are included below in Section 3.1.

[2] https://www.nature.scot/doc/naturescot-research-report-1283-disturbance-distances-review-updated-literature-review-disturbance

The overall goal of the BEMP is to restore and enhance the ecological value of upland, woodland and riparian habitats which will benefit black grouse, local wader populations and biodiversity in general.

The precise objectives and management prescriptions for the Management Units will depend on the current state of the habitat and the factors acting upon it. In order to inform these objectives and detail appropriate management prescriptions further surveys are required to be undertaken in developing the final BEMP, these data can also be used to help inform the baseline conditions. These surveys may include, but are not limited to, the following:

- National Vegetation Classification (NVC) surveys of areas not already mapped (part of Management Unit A which was out with the Site boundary and survey area required to inform the impact assessment);
- Relevant peatland condition assessments in line with Peatland Action guidance[3];
- Common Standards Monitoring of Upland Habitats[4];
- Hydrology walkover to identify opportunities for drain blocking and restoration of the peatland water table;
- Use of 5 m Digital Terrain Model (DTM) to determine slope and number of drains required;
- Herbivore Impact Assessment (HIA) using methodology from SNH[5];
- Peat depth surveys to complete phase 1 coverage of Management Unit A;

3.1 Management Units

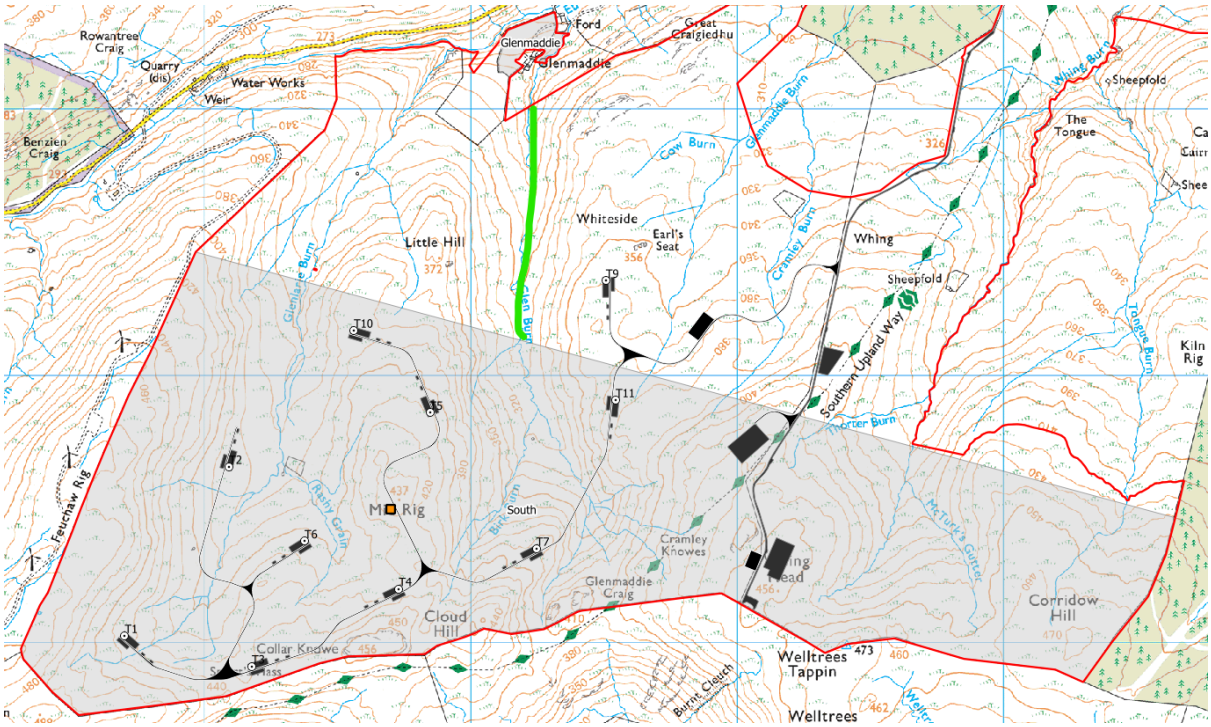
3.1.1 Management Unit A

Management Unit A is currently 415 ha and comprised of predominantly marshy grassland, with a mosaic of other upland habitats including unimproved acid grassland, blanket bog and wet modified bog.

As noted in **section 8.8.3 of Chapter 8, Ornithology of the AEI Report**, it is proposed to extend this management unit to the north west around Little Hill (where Lek 1 was recorded) and Glenmaddie (the area to the west of turbine 9 within the Site) – this would include the area to the west of the green line marked on **Image 1** below within Management Unit A. The extension of this management unit would be to ensure that suitable lekking habitat for black grouse remains at the Site (in proximity to the habitat mosaics required by the species) and to allow for further wader enhancement possibilities (these may be, but would not be limited to: opportunities to create wader scrapes and review the opportunities for other wader enhancements in line with those used by the Agri-Environment Climate Scheme (AECS) or similar regional wader schemes) at a distance from the turbine array.

[3] NatureScot Peatland Action (2021). Peat Depth and Peatland Condition Survey. Available at: Peat Depth and Peatland Condition Survey (nature.scot) [Accessed May 2023]
[4] JNCC. (2009). Common Standards Monitoring Guidance for Upland Habitats. Version July 2009. ISSN 1743-8160.
[5] SNH (1998a). A Guide to Upland Habitats – Surveying Land Management Impacts – Volume 1.
SNH (1998b) A Guide to Upland Habitats – Surveying Land Management Impacts – Volume 2.

Image 1: Indication of extension area of Management Unit A



Within suitable locations in the management area, the aim is to enhance peatland habitat and improve the suitability of grassland habitats for curlew and other wader species, via measures including drain blocking, restoring eroded areas, and bracken and rush control (notably around Glen Burn and Birk Burn).

Peatlands are important for preventing and mitigating the effects of climate change, preserving biodiversity and minimising flood risk. In the south-east of the Site, there are areas that have been categorised as Class 1 or Class 2 peatland (Figure 7.2). Field surveys noted areas of peat hagging and erosion (Appendix A7.1), which can also be seen via aerial imagery, and suggests that there may be opportunity for rewetting of the peatland through ditch blocking. This would encourage bog species to recolonise and promote peat formation in these areas. Signs of drainage ditches can also be seen in the wider management unit, such as in the south-west corner. Some of these signs coincide with areas of blanket bog or wet modified bog, as identified in the course of baseline surveys, and as such would also benefit from restoration.

To further enhance biodiversity at the Site, low density riparian planting of native broadleaf species would be carried out along suitable watercourses within the management area (where peat depth <0.5m and botanical conditions are suitable (avoidance of sensitive GWDTEs[6])). Watercourses within the Site form part of the River Nith catchment of the Solway Tweed river basin district and are currently largely free of shrubs and trees, particularly towards the higher altitudes.

Riparian planting will enhance biodiversity at the Site by improving the ecological quality of watercourses (allochthonous material inputs, thermoregulation, erosion reduction), create shelter opportunities for otter (*Lutra lutra*), establish improved habitat corridors (including for black grouse), provide shading to watercourses and aiding in temperature regulation and cover for fish, as well as provide visual screening of turbines from species using the watercourses. From a

[6] https://forestry.gov.scot/publications/117-briefing-note-18-publication-of-gwdte-practice-guide

hydrology perspective, riparian woodland planting is considered beneficial for natural flood management by intercepting rainfall, improving bank stability, increasing evaporation and uptake by vegetation and infiltration. The River Nith is shown on SEPA indicative mapping[7] as having a localised 10% chance of flooding annually, therefore riparian woodland planting along the watercourses upstream would potentially benefit natural flood management in the catchment. The Phase 1 peat depth survey results suggest that there are suitable areas which would lend themselves to such planting; e.g., McTurk's Gutter, Birk Burn, southern tributaries of Glenlarie Burn.

Further surveys would determine suitable refined areas within Management Unit A for peatland restoration, grassland enhancement and riparian planting.

3.1.2 Management Unit B (Glenmaddie)

Management Unit B is 3.2 ha and comprised of mainly semi-improved grasslands, with areas of marshy grassland. The area is bordered by broadleaved semi-natural woodland on three sides, with large stands of continuous bracken along the woodland boundaries. Although a native species, bracken can become problematic, inhibiting grasslands and woodland regeneration. Management Unit B is located within 750m of a black grouse lek identified in the course of the baseline ornithology surveys.

Within the management area the aim is for expansion of broadleaved woodland and improvement in habitat suitability for black grouse. Natural regeneration of woodland would be encouraged along the existing woodland edges, by bracken control, as well as through planting small areas of low-density native broadleaf species across the management area. Native hedgerows would be planted along the edges of the track which runs through the management area to Glenmaddie farm buildings; this would provide screening of the road from the surrounding habitats, and a sheltered corridor for use by numerous species (including bats) for commuting and foraging. Planting of low-density woodland, along with managing grazing to produce a more varied sward height, would improve habitat suitability for black grouse. Management of the habitats in this way would also benefit barn owl, which are known to be nesting in the area. Woodland fringe and black grouse are 'high focus' habitat/species identified by the Galloway and Southern Ayrshire Biosphere.

An increase in the area of broadleaved woodland and hedgerow will enhance biodiversity through providing habitat and connectivity for a variety of birds, insects and mammals, as well as mitigating the effects of climate change.

4 AIMS, OBJECTIVES AND MANAGEMENT PRESCRIPTIONS

The Aims define the general BEMP goals, and the related Objectives further define the Aims into quantifiable targets. The Prescriptions detail the indicative management works to be implemented to achieve these Aims and Objectives. Annex A provides an indicative timetable for the implementation of the various Prescriptions.

As discussed in Section 3 above, detailed appropriate Objectives and Prescriptions will be developed post-survey for the final BEMP based on survey findings. However, the experience

[7] https://map.sepa.org.uk/floodmaps

gained from providing and delivering plans for similar upland sites and peatland habitats would suggest that as an outline the Aims, Objectives and Prescriptions would likely include or be similar to the below.

4.1 Aim 1: Restore and enhance peatland habitat (Management Unit A)

Objective 1.1	Increase the abundance and distribution of major peat forming species, particularly Sphagna (particularly key blanket mire indicator species such as *Sphagnum papillosum* and *S. medium*).
Prescription 1.1	Dam active drains[8] (even if vegetated) in order that the water level is raised sufficiently to create conditions suitable for species mentioned within Objective 1.1. This should be carried out under the supervision of a suitably qualified ECoW. As detailed within the guidance, this technique requires donor peat turves to be excavated adjacent to the drain and then keyed into the drain itself. The divot formed by excavating the donor turve is then infilled by pulling and compressing the surrounding peat and peatland vegetation into this area – the donor turve is taken from alternate sides to avoid a line of restored divots forming long one side of the drain. The reason the donor turve needs to be taken adjacent to the drain is to ensure it retains its consolidated structure which enables its reliable use in damming the drain
Prescription 1.2	The following activities would be prohibited within the Management Unit: • clearing out of existing ditches; • application of any insecticides, fungicides or molluscicides; • application of lime or any other substance to alter the soil acidity; • cutting or topping of vegetation except to control injurious weed species or to improve the biodiversity of the habitat; • burning of vegetation or other materials; • use of roll or chain-harrow; • planting trees; • carrying out any earth moving activities; • use of off-road vehicle activities with the exception of use of low scale agricultural vehicle movements (quad bike and land rover) or low impact vehicles; • construction of tracks, roads, yards, hardstandings or any new structures (not associated with the Proposed Development); and • storage of materials or machinery.

[8] According to methodology detailed in: Peatland Action (2022) Technical Compendium. Available at: https://www.nature.scot/doc/peatland-action-technical-compendium [Accessed May 2023]

4.2 Aim 2: Enhance habitats for waders (Management Unit A)

Objective 2.1	Maintain and increase the numbers of breeding pairs of curlew and lapwing from baseline (between 10-17 and 2-5 territories in 2019 respectively).
Prescription 2.1	Where a tall, dense (>30 % rush cover) sward of rushes has established, cut rushes to create a more open habitat, baling cuttings for removal to avoid ground smothering[9].
Prescription 2.2	Control bracken in Management Unit A.

4.3 Aim 3: Enhance the ecological and hydrological value of watercourses (Management Unit A)

Objective 3.1	Establish new riparian woodland and scrub (approximately along 2 km of watercourse – to be confirmed by additional survey).
Objective 3.2	Visually screen and shade watercourses with suitable trees and shrubs to aid in temperature regulation and mitigate potential visual impacts on riverine species.
Objective 3.3	Stabilise river-banks, maintain or improve water quality, and reduce flooding risks along sections of watercourse suitable for planting.
Prescription 3.1	Plant low density native broadleaf species along the banks of watercourses in line with guidance from SEPA[10] and the Woodland Trust[11]. Tree tubes should be used and low impact ground preparation techniques such as screefing or inverted mounding.

4.4 Aim 4: Increase area of broadleaved woodland and hedgerow (Management Unit B and substation / BESS locations) and enhance habitat for black grouse (Management Unit B)

Objective 4.1	Establish new broadleaved woodland in suitable areas within Management Unit B (to be confirmed by additional survey).
Objective 4.2	Create approximately 300 metres of new species-rich hedgerow[12]
Objective 4.3	Improve habitat suitability for black grouse.
Objective 4.4	Establish new sporadic broadleaf woodland adjacent to the substation and BESS infrastructure to create partial screening
Prescription 4.1	Planting small areas of low-density native broadleaf species across Management Unit B and adjacent to both the substation and BESS. In management Unit B, this is to comprise areas of birch, willow, hawthorn,

[9] In line with: Farm Advisor Service (FAS) (2017). Management and Conservation for Farmland Waders. Technical Note TN688.
[10] SEPA (2009). Engineering in the Water Environment Good Practice Guide. Riparian Vegetation Management. Second Edition. WAT-SG-44.
[11]Woodland Trust (2016). Keeping Rivers Cool: A Guidance Manual. Creating riparian shade for climate relief adaptation.
[12] In line with Scottish Government (2017). Supporting guidance for Planting or Replanting of Hedges. Available at: https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/management-options-and-capital-items/planting-or-replanting-of-hedges/guidance-for-planting-or-replanting-of-hedges/ [Accessed May 2023]

rowan, and alder, with uneven woodland edges to maximise the edge preferred by black grouse[13]. Adjacent to the substation and BESS, this should comprise of small areas of birch (on appropriate habitat types) to create a partial visual screening effect and minimise visual impact through the operational period.

Prescription 4.2	Control bracken on existing woodland fringes to allow natural expansion of woodland and scrub.
Prescription 4.3	Plant approximately 300m of new native species-rich hedgerow along farm track, using appropriate species[12].
Prescription 4.4	Manage rough grazing to create a sward with some areas of over 30cm in height to provide a mosaic of open and dense vegetation for black grouse[13].

5 MONITORING

5.1 Aim 1: Restore and enhance peatland habitat (Management Unit A)

The following monitoring would be undertaken to evaluate the success of this aim:

- Habitat monitoring will evaluate the success of restoration and enhancement of peatland. This will be achieved by recording changes to the structure and composition of the vegetation and species abundance, evenness and diversity. Recording of impacts from deer/livestock will also be included in the monitoring programme, using the HIA methodology described in SNH guidance[5] at a landscape scale.

  A representative sample of permanent quadrats will be established within Habitat Management Unit A to gather sufficient data to inform future management and assess the trajectory of plant species and habitats. The respective monitoring surveys will be carried out at the most appropriate times of year (e.g. flora surveys versus browsing impact surveys). Repeat surveys will be carried out in the same month in each monitoring year (1, 2, 3, 5 10, 15) to gather comparable data. Photographs will also be taken of each sample quadrat, as well as overview photographs of the management unit. The final detailed methods will be agreed with the HMG.

- Any installed peat dams or reprofiled haggs will be monitored to ensure works are successful over the first three years after works are completed. Remedial measures will be undertaken if restoration works have failed.

5.2 Aim 2: Enhance habitats for waders (Management Unit A)

The following monitoring would be undertaken to evaluate the success of this aim:

- Breeding Bird Surveys (BBS) will be undertaken in years 1, 2, 3, 5, 10 and 15 to determine the distribution of territories for target wader species.
- Habitat monitoring for grassland in line with the approach detailed above for Aim 1.

[13] FAS (2018). Technical Note TN711. Black Grouse Management on Farmland.

5.3 Aim 3: Enhance the ecological and hydrological value of watercourses (Management Unit A)

Planted areas will be monitored for the first five years following planting to ensure successful establishment. Trees will be inspected by suitably experienced personnel and evidence of damage (e.g. browsing by deer) or disease will be recorded. Where necessary, failed trees should be replaced in the winter following the inspection (i.e. November to March). Presence of any invasive non-native species will also be a focus of the inspection, with any specimens recorded being removed in a timely and appropriate manner.

5.4 Aim 4: Increase area of broadleaved woodland and hedgerow, and enhance habitat for black grouse (Management Unit B and surrounding the substation / BESS areas)

The following monitoring would be undertaken to evaluate the success of this aim:

- Black grouse surveys will be undertaken in years 1, 2, 3, 5, 10 and 15 to monitor success of planting for black grouse.
- Habitat monitoring of planted areas in line with the approach detailed above for Aim 3.
- Habitat monitoring of woodland fringes to ensure bracken control is undertaken appropriately and monitor natural regeneration of woodland species (years 1, 2, 3, 5, 10, 15).

ANNEX A. MANAGEMENT AND MONITORING TIMETABLE

Table A-1 Management and Monitoring Timetable

Activity	1*	2	3	4	5	6	7	8	9	10	11	12	13	14	15...
Drain blocking and hagg reprofiling (Management Unit A)	✓														
Native broadleaf Planting (Management Units A and B)	✓														
Native hedgerow planting (Management Unit B)	✓														
Rush management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bracken control	✓	✓	✓		✓			✓			✓			✓	
Grazing management (if required) (Management Unit B)	Throughout lifetime of BEMP														
Excluded activities (Management Units A and B)	Apply from the commencement of construction														
Habitat monitoring (including HIA) (Management Units A and B)	✓	✓	✓		✓					✓					✓
Peat dam inspections (Management Unit A)	✓	✓	✓												
Planted tree/hedgerow inspections (Management Units A and B)	✓	✓	✓	✓	✓										
Reporting to BMG	✓	✓	✓	✓	✓					✓					✓
BBS and Black grouse surveys (Management Units A and B)	✓	✓	✓		✓					✓					✓

* First year after final commissioning of the Proposed Development

APPENDIX 10.1 PEAT SLIDE RISK ASSESSMENT

Cloud Hill Wind Farm

Appendix 10.1 Peat Slide Risk Assessment

PREPARED FOR

BayWa r.e.

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CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronym	Description
AEI	Additional Environmental Information
BESS	Battery Energy Storage System
ECU	Energy Consents Unit
EIA	Environmental Impact Assessment
PLHRA	Peat Landslide Hazard Risk Assessment
PSRA	Peat Slide Risk Assessment
SEPA	Scottish Environment Protection Agency
T	Turbine

1. INTRODUCTION

1.1 BACKGROUND

Environmental Resource Management (ERM) were commissioned by Cloud Hill Wind Farm Ltd (the Applicant) to carry out a Peat Slide Risk Assessment (PSRA) for the proposed Cloud Hill Wind Farm (the Revised Development). This updated PSRA has been prepared by ERM Ltd as a technical appendix to the AEI Report and should be read in conjunction with **Chapter 10, Geology and Peat of the AEI Report** and **Appendix 10.2, Outline Peat Management Plan of the AEI Report**.

The changes to the Original Development from the EIA to the Revised Development for the AEI report include:

- The relocation of Turbine 1 (T1) (from E:272661, N:604825 to E:272702, N:605026)
- Removal of Turbine 8 (T8); and,
- Relocation of Substation / BESS Compound.

The Revised Development comprises:

- 10 three-bladed wind turbines with a maximum tip height of up to 180 m, rotor diameters of approximately 150 m and hub heights of approximately 105 m, and associated foundations and hardstanding areas;
- Network of underground cabling;
- A permanent met mast ;
- Access tracks linking the turbine locations;
- Substation Compound including a Substation Building and separate Control Building with welfare facilities, associated electrical plant and equipment, security fencing and wastewater holding tank;
- A Battery Energy Storage System (BESS) site will be located south of the substation;
- Temporary Construction Compound;
- 3 borrow pits for aggregate extraction;
- Upgraded site access

The Revised Development Site Layout is shown on **AEI Figure 10.1.1** appended within Appendix A of this PSRA. Further detail of the design and layout of the Revised Development is provided in **Chapter 4, The Revised Development of the AEI Report**.

1.2 SCOPE AND PURPOSE

This PSRA provides factual information on the peat survey results relating to the proposed turbine locations. The desk-based information and Site surveys have been utilised to assess the potential risk of any peat landslide. The methodology adopted and details on the assessment are outlined in Sections 3, 4 and 5. The assessment has been undertaken in accordance with Scottish Government Guidance[1] in assessing the likelihood and consequence of such an event.

[1] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

1.3 PROJECT TEAM

Team Member	Job Title	Qualifications	No. Years Experience
Gregor Hirst	Senior Engineer	BSc (Hons)	6 Years
Tomos Ap Tomos	Technical Director	BEng (Hons) MCIHT	25 Years

This assessment was undertaken by Gregor Hirst (BSc Hons), a Geo-Environmental Engineer of 6 years. This Chapter has been technically reviewed by Tomos Ap Tomos, Technical Director of Engineering.

2. SITE INFORMATION

2.1 SITE DESCRIPTION AND TOPOGRAPHY

The Site is approximately 4.5 km South of Sanquhar, Dumfries and Galloway, while the entrance to the Site is 0.5 km South-West of the town. The Site is centred on NGR 274802, 606254 and the total area within the Site boundary is approximately 805 hectares (ha).

The operational Whiteside Hill Wind Farm is located approximately 1.6 km southwest of the Site and the operational Twentyshilling Hill Wind Farm is approximately 4.2 km to the southeast. In addition, there are also the nine turbines of Sanquhar Wind Farm to the north, and Hare Hill and Extension further north-west. Although comprising only two turbines at 62 m, there is also Sunnyside Farm on the northern side of Sanquhar.The Site topography is fairly complex, the land within the Site boundary consists predominantly of open moorland used for grazing with elevations ranging from 470 m Above Ordnance Datum (AOD) at the summit of Corridow Hill in the South-East to 150 m AOD in the North-East. There are a number of notable hilltops and watercourses present within the Site boundary, including:

Hilltops:

- Corridow Hill (470 m AOD), located in the South-East of the Site;
- Mid Rig (437 m AOD), located in the East of the Site;
- Cloud Hill (451 m AOD), located in the South of the Site, and
- Whing Head (456 m AOD), located in the South of the Site.

Watercourses:

- Whing Burn.
- Glenmaddie Burn.
- Glen Burn.
- Glenlarie Burn.

2.1.1 AERIAL PHOTOGRAPHY

A historic review of aerial photography available from the Site was undertaken. **Image 1** shows the aerial photography from 2020 for the Site and the surrounding areas. It can be seen that there is not much infrastructure in the area. There are a few minor roads as well as forestry and agricultural land used for grazing.

IMAGE 1 - 2018 AERIAL VIEW OF THE SITE AND SURROUNDING AREAS

Historical Site imagery between 1985 and 2022 is shown in **Image 2.** The Site was completely vacant in 1985. Prior to 2010 some forestry was established in the area.

IMAGE 2 - HISTORICAL SITE IMAGERY BETWEEN 1985 – 2022

Historical Imagery	
	
1985	2010
	
2019	2022

2.2 PUBLISHED GEOLOGY

2.2.1 SUPERFICIAL SOILS

Published geological mapping presented in the BGS Geology of Britain Viewer[2] and BGS GeoIndex[3] identifies Glacial Till as the soil type covering the majority of the Site area. There are also areas of Glaciofluvial and Alluvial deposits, identified as being Sand, Silt and Gravel, throughout North-eastern areas of the Site.

The carbon and Peatland Map 2016[4] details that there are areas on Site that consist of Class 1, 2, 3, and 5 peat.

According to the National Soil Map of Scotland[5], the majority of the Site falls under the soil classification "mineral gleys." A small area of the Site is described as "peaty gleys" and another area as "brown soils."

2.2.2 SOLID GEOLOGY

Published mapping by the BGS also provides information on the bedrock geology present at the Site location. The bedrock geology is identified as being a Kirkcolm formation – Wacke, a sedimentary bedrock, in the West of the Site; whereas the Eastern area of the Site is underlain by a Scottish Lower Coal Measures formation, also a sedimentary formation. The South of the Site sits upon a combination of different sedimentary and igneous rock formations, including Moffat Shale, Portpatrick – Wacke and Crawford Group – Chert.

A reverse or thrust fault is present at rockhead and runs through the central northern sector of the Site in a west - east orientation.

2.2.3 GEOMORPHOLOGY

Geomorphological mapping can act as a primary instrument in highlighting geological risk factors when considering peat slides. The Scottish Government guidance[6] provides 5 basic features in which a geomorphological map should convey:

- The position of major slope breaks (e.g. convexities and concavities);
- The position and alignment of major natural drainage features (e.g. peat gullies and streams);
- The location and extent of erosion complexes (e.g. haggs and groughs (where haggs are defined as overhanging areas of peat due to water erosion below or cut areas of peat and groughs are defined as natural channels or fissures in peat), and large areas of bare peat);
- Outlines of past peat landslides (including source areas and deposits), if visible; and
- The location, extent and orientation of cracks, fissures, ridges and other pre-failure indicators.

[2] BGS Geology of Britain Viewer [online] Available at: GeoIndex - British Geological Survey (bgs.ac.uk) (Accessed 16/05/2023)
[3] BGS GeoIndex [online] Available at: GeoIndex - British Geological Survey (bgs.ac.uk) (Accessed 16/05/2023)
[4] Scotland's Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 16/05/2023)
[5] Scotland's Environment (2016) National Soil's Map of Scotland. [online] Available at: Scotland's Soils - soil maps (environment.gov.scot) (Accessed 06/06/2023)
[6] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

AEI Figure 10.1.2, Geomorphological Map has been prepared to inform a baseline information of the Site with consideration given to existing site conditions through site visit and aerial photography, slope angle and geomorphological data.

Across the Site as a whole, there is little evidence of past peat failure. Evidence of peat hagging and ground instability was not noted at the Site. There are a few instances of exposed peat on the Site. These all occurred on steep slopes or close to watercourses and are displayed in **Image 3**. Livestock is present on the Site, which could also contribute to the erosion observed. A review of aerial photography identified little to no scaring across the Site.

IMAGE 3 - EXPOSED PEAT ON THE SITE

Aerial photography was also used to identify potential areas of artificial drainage to be further investigated during the Site walkover. Evidence of artificial drainage was noted during the Site walkover survey and is presented in **AEI Figure 10.1.2, Geomorphological Map**.

The presence of artificial drainage on the Site may have resulted in the dewatering of the peatland in these areas which would, in turn, reduce its capacity to act as a carbon store.

2.2.4 HYDROLOGY AND HYDROGEOLOGY

The groundwater units underlying the Site are identified by Scotland's Environment mapping service[7] as the Upper Nithsdale groundwater body. It is classified as 'poor' by SEPA.

BGS 1:625,000 scale mapping and the BGS GeoIndex shows the bedrock aquifers underlying the Site to be greywackes, which are typically grey, hard varieties of sandstone. The two bedrock aquifers present are a Portpatrick Formation and a Kirkholm Formation, the two aquifers are separated by a thrust fault which dissects the Site. Both are described as low productivity aquifers, where most of the groundwater flow is in the near-surface weathered zone and secondary fractures.

The bedrock groundwater units are predominantly overlain by Glacial Till, with some areas of peat also present at the Site. These soils are largely impermeable and act as a barrier to the vertical flow of water. Alluvium and glaciofluvial deposits are found in some north eastern areas of the Site, these deposits are highly permeable and allow the vertical flow of water.

The BGS groundwater vulnerability[8] is class 5 in parts of the Site, defining the underlying rocks as being vulnerable to most pollutants, with rapid impact in many scenarios. Other parts of the Site are identified as being class 4a, where the underlying rocks are defined as being vulnerable to pollutants that are not easily absorbed or transformed.

Vulnerability classes range from 1 to 5, with 5 being most vulnerable. Class 2 is subdivided into 2a, 2b and 2c. It is the hydrogeological characteristics within the pathway rather than the 'importance' of a particular aquifer that results in the final vulnerability classification. The methodology behind the classification assumes that where contaminants move through unsaturated fractured bedrock, no attenuation of pollutants can take place. Large parts of Scotland show areas of Classes 4 and 5, reflecting the widespread occurrence of rocks dominated by fracture flow. Rocks which are not exposed at the surface and are overlain by superficial deposits have a reduced potential for attenuation of contaminants. The groundwater vulnerability map is designed to be used at a scale of 1:100,000 and is not indicative of site-specific conditions.

2.2.5 METEOROLOGICAL DATA

There is no weather station located on the Site itself, but there is data from a rainfall station located approximately 3 km east of the Site[9] that has been included to give an indication of the rainfall expected at the Site. This data is included in **Table 1** -, and includes rainfall data for the Eliock rainfall station located to the east of the Site.

Long term average rainfall data (1991 to 2020) obtained by the Meteorological Office[10] at the Glenlee station, located approximately 27.5 km south-west of the closest turbine location was used in **Chapter 11, Hydrology and Hydrogeology of the AEI Report**. This data can be

[7] SEPA (undated) Groundwater classification [Online] Available at: https://map.environment.gov.scot/sewebmap/ (Accessed: 06/06/2023)
[8] BGS (2015) Groundwater Vulnerability (Scotland) GIS dataset, Version 2 [Online] Available at: http://nora.nerc.ac.uk/id/eprint/509618/1/OR15002.pdf (Accessed: 16/05/2023)
[9] SEPA (2023) Rainfall Data for Scotland [online] Scottish Rainfall Data - provided by Scottish Environment Protection Agency (SEPA) (Accessed 21/03/2023)
[10] Met Office (n.d.) UK Climate Averages [Online] Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcv12y3xn (Accessed: 19/06/2023)

viewed within **Chapter 11, Hydrology and Hydrogeology of the AEI Report** and provides a long term average rainfall expectancy.

TABLE 1 - MEAN MONTHLY RAINFALL DATA (2022 – 2023)

Rainfall Station	Mean Monthly Rainfall (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eliock	159.5	122.6	111.8	70.0	82.7	75.8	77.9	75.6	107.2	149.7	153.8	154.6

2.3 SOURCES OF INFORMATION

The following sources of information were used as part of the desk study investigations:

- British Geological Survey - Online GeoIndex[11];
- Geosure landslip data[12];
- Ordnance Survey (OS) topographical information;
- Historical OS mapping;
- Aerial and Satellite photography via Ordnance Survey and Google Earth;
- Defra 'Magic' maps;
- Soil Survey of Scotland - 'MacAulay Institute for Soil Research' 1984[13];
- Scottish Government (SG) - 'Peat Landslide Hazard and Risk Assessments' December 2017[14];
- Scottish Government, Scottish Natural Heritage, SEPA (2017) Peatland Survey, Guidance on Developments on Peatland[15];
- Carbon and Peatland Mapping 2016[16];
- The Scottish Government - Scotland's Third National Planning Framework, 2014[17];
- The Scottish Government - Scottish Planning Policy, 2014[18];
- Assessments by other EIA specialists (specifically hydrology and ecology for data on sensitive receptors); and

[11] BGS GeoIndex [online] Available at: https://mapapps2.bgs.ac.uk/geoindex/home.html (Accessed 06/06/2023)
[12] BGS GeoSure [online] Available at: BGS Geosure sample datasets - British Geological Survey (Accessed 06/06/2023)
[13] Scotland's Environment [online] Available at: Soil Survey of Scotland 1:250 000 scanned maps | Scotland's soils (environment.gov.scot) (Accessed 06/06/2023)
[14] Scottish Government [online] Available at: Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments (www.gov.scot) (Accessed 06/06/2023)
[15] Scottish Government [online] Available at: Guidance+on+developments+on+peatland+-+peatland+survey+-+2017.pdf (www.gov.scot) (Accessed 06/06/2023)
[16] Scotland's Environment [online] Available at: Carbon and peatland 2016 map | Scotland's soils (environment.gov.scot) (Accessed 06/06/2023)
[17] Scottish Government [online] Available at: National Planning Framework 3 - gov.scot (www.gov.scot) (Accessed 06/06/2023)
[18] Scottish Government [online] Available at: Scottish planning policy - gov.scot (www.gov.scot) (Accessed 06/06/2023)

- Scotland's Environment Interactive Map[19]

No relevant comments from landowners, land managers, local residents or newspaper articles were found to aid this assessment.

3. GUIDANCE AND METHODOLOGY

3.1 GENERAL GUIDANCE ON PEAT FAILURE

The Scottish Government guidance 'Peat Landslide Hazard and Risk Assessments - Best Practice Guide for Proposed Electricity Generation Developments[20]', divides peat instability into two categories, 'peat slides' and 'bog bursts'. The guidance states that peat slides have a greater risk of occurrence in areas where:

- Peat is encountered at or near to ground surface level;
- The thicknesses are recorded in the region of 2.0 m (above which, in general terms, peat instability would increase with peat thickness); and
- The slope gradients are steep (between 5° and 15°).

Bog bursts are considered to have a greater risk of occurrence in areas where:

- Peat depth is greater than 1.5 m; and
- Slope gradients are shallow (between 2° and 10°).

It should be noted however that peat instability events, although uncommon, can occur out with these limits and reports of bog bursts are generally restricted to the Republic of Ireland and Northern Ireland.

Preparatory factors which effect the stability of peat slopes in the short to medium-term include:

- Loss of surface vegetation (deforestation);
- Changes in sub-surface hydrology;
- Increase in the mass of peat through accumulation, increase in water content and growth of tree planting; or
- Reduction in shear strength of peat or substrate due to chemical or physical weathering, progressive creep and tension cracking.

Triggering factors which can have immediate effects on peat stability and act on susceptible slopes include:

- Intensive rainfall or snow melt causing pressures along existing or potential peat/substrate interfaces;
- Alterations to drainage patterns, both surface and sub-surface;

[19] Scotland's Environment [online] Available at: Map | Scotland's environment web (Accessed 06/06/2023)
[20] Scottish Government (2017) Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments [Online]. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2017/04/peat-landslide-hazard-risk-assessments-best-practice-guide-proposed-electricity/documents/00517176-pdf/00517176-pdf/govscot%3Adocument/00517176.pdf (Accessed 16/05/2023)

- Peat extraction at the toe of the slope reducing the support of the upslope material;
- Peat loading (commonly due to stockpiling) causing an increase in shear stress; and
- Earthquakes or rapid ground accelerations such as blasting or mechanical movement.

Consideration of peat stability should form an integral part of the design of a windfarm development. While peat does not wholly provide a development constraint, areas of deep peat or peat deposits on steep slopes should be either avoided through design and micro-siting or mitigation measures should be designed to avoid potential instability and movement.

3.2 ASSESSMENT APPROACH

This PSRA has been carried out in accordance with the Scottish Government guidance outlined in Section 3.1.

In 2023 the new National Planning Framework 4 (NFP4)[21] for Scotland was published. In relation to peat and the assessment of effects on resource, NPF4 has a policy specifically relating to soils, aimed "*to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development*". These policy, framework and guidance documents are therefore also considered in this PSRA. The PSRA undertaken is based on:

- Desk based assessment;
- Site visits;
- Historic peat probing data;
- Further peat probing including infrastructure specific probing; and
- A hazard and risk ranking assessment.

The area of the Revised Development subject to assessment was determined by the emerging Revised Development layout which considered initial findings from desk studies and anticipated peat deposits as well as other physical and environmental constraints.

3.3 PEAT PROBING METHODOLOGY

Initial peat probing (phase one) was undertaken by ERM as part of the preliminary EIA works which combined preliminary probing and detailed peat probing within the boundaries of a Site layout iteration. The probing covered an initial design iteration at 100 m centres within the proposed Site boundary where forestation allowed. Following on from this, infrastructure was probed at a more detailed methodology (phase two). Proposed access tracks were probed at 25 m intervals and at 25 m either side to create a corridor. Localised 10 m centres at turbines out to 50 m radius were also sunk in accordance with Scottish Government guidance.[22]

The entire section of access track to the Revised Development was not probed as the road is existing. Instead the internal bends of the track were probed in order to better understand the peat in these areas in the event that the track requires widening during construction. There will be no construction taking place on this portion of the access track, therefore it was not probed fully as part of the Phase 2 assessment.

[21] Scottish Government (2023) National Planning Framework 4. [online] National Planning Framework 4 (www.gov.scot) (Accessed on-06/06/2023)
[22] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

3.3.1 DEVELOPMENT OF HAZARD RANK

The early stages of the PSRA includes a desk study of existing data and considers whether Site visits and peat probing were carried out in parallel with the assessment of wider constraints and the development of the wind farm layout. Following identification of peat depths within the Site, the assessment was carried out to determine the potential effects on the peat resource from construction activities which would include:

- Construction of tracks;
- Excavation of turbine bases;
- Foundation construction;
- Construction of harstandings; and
- Temporary storage of peat.

An assessment of the peat probing data and a review of any available Site information would be undertaken and a hazard rank calculated zonally across the Site reflecting risk of peat instability/constraint to construction.

Where practical, the Revised Development layout was designed to avoid areas of a risk score above 'low'. Where this has not been achieved, areas effected have been discussed in both the EIA as having significant effect, with relative mitigation measures proposed to reduce this, and recorded on a risk register which sets out specific mitigation measures which are considered necessary to reduce the risk of inducing instability.

4. SITE SURVEYS

4.1 INTRODUCTION

The existing peat depths across the Site have been determined through a phased survey approach. The survey was initiated to inform the EIA and Site design work while supporting the PSRA.

Phase 1 of the peat depth surveys was carried out in May 2022 by ERM, the results of this survey informed the initial site layout of the Original Development. This survey comprised a 100 m grid covering the whole site, where possible. This rationale of probing is in accordance with the phase one approach as detailed in the Scottish Government guidance for investigating peat.[23]

Further peat depth surveys (phase two) were undertaken in October and November 2022 as part of the design finalisation process, including during the "chilled" layout and following design freeze. Targeted peat probing was carried out across proposed infrastructure including proposed turbines, access tracks, borrow pit, BESS, substation compound and other key infrastructure. Peat depths were measured along the proposed access tracks at 25 m centres with offsets of 25 m on either side of the centre line, while an intense 10 m crosshair provided detailed peat information at the proposed turbine locations.

Additional field surveys were undertaken to target the revised layout changes proposed (the Revised Development), and including areas proposed for temporary peat storage revised

[23] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

Substation and BESS location and additional probing a T4, T6 and T11 along with the revised T1 position. In total (including the EIA probing) 3096 probes were sunk.

4.2 PEAT DEPTH

A total of 3,096 probes were recorded during the phase one, phase two and most recent peat probing with depths ranging between 0.0 m and 5.0 m.

Peat depths were generally shallow throughout the Site, with 72.9% of probes recording depths of between 0 and 0.5 m and 91.51% no greater than 1.0 m. However, a small concentration of probes along a section of proposed track in the central southern portion of the Site recorded peat depths of up to 5.0 m. The average peat depth across the Site was recorded as 0.48 m.

AEI Figure 10.1.3 illustrates the recorded peat depths, while **AEI Figure 10.1.4** displays the interpolated peat depths. The recorded peat depths are summarised in

Table 2 below:

TABLE 2 - PEAT SURVEY SUMMARY

Peat Depth Range (m)	№ of Peat Probes	Percentage of Total (%)
0.00 - 0.50	2257	72.90
0.51 - 1.00	576	18.60
1.01 - 1.50	130	4.20
1.51 - 2.00	71	2.29
2.01 - 2.50	35	1.13
2.51 - 3.00	14	<1.0
3.01 - 3.50	2	<1.0
3.51 - 4.00	0	0
4.01 - 4.50	8	<1.0
4.51 - 5.00	3	<1.0
Total	3,096	

4.3 SUBSTRATE

To assist with the PSRA, an estimation of the underlying substrate was obtained during the survey works, comprising a resistance-based approach at the base of the probe.

- Gradual refusal – Clay;
- Crunching/Gritty – Weathered Rock/Sand/Gravel; or
- Abrupt Refusal/Solid – Rock.

The substrate parameters are included in the Hazard and Exposure Assessment in Section 5 of this report.

5. HAZARD AND EXPOSURE ASSESSMENT

5.1 BACKGROUND

A 'Hazard Ranking' system has been applied across the Site based on the analysis of risk of peat landslide as outlined in the Scottish Government guidance[24]. This is applied on the principle:

Hazard Ranking = Hazard x Exposure

Where 'Hazard' represents the likelihood of any peat slide event occurring and 'Exposure' being the impact or consequences that a peat slide may have on sensitive receptors that exist on and around the study area.

5.2 METHODOLOGY

The determination of Hazard and Exposure values is based on a number of variables which impact the likelihood of a peat slide (the Hazard), and the relative importance of these variables specific to the Site.

Similarly, the consequences or Exposure to receptors is dependent on variables including the particular scale of a peat slide, the distance it will travel and the sensitivity of the receptor.

In the absence of a predefined system, the approach to determining and categorising Hazard and Exposure is determined on a Site by Site basis. The particular system adopted for the Revised Development PSRA assessment is outlined in the following sub sections.

5.3 HAZARD ASSESSMENT

The potential for a peat slide to occur during the construction of a windfarm depends on several factors, the importance of which can vary from Site to Site. The factors requiring considerations would typically include:

- Peat depth;
- Slope gradient;
- Substrate material;
- Hydrology;
- Distance between the closest receptor and the point being evaluated;
- Evidence of instability or potential instability; and
- Vegetation cover.

Of these, peat depth and slope gradient are considered to be principal factors. Without a sufficient peat depth and a prevailing slope, peat slide hazard would be negligible. For the Revised Development, the substrate material is also considered a relevant factor in relation to determining any risk of slide.

[24] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

The slope data is derived from Ordnance Survey 5 m Digital Terrain Model (OS 5 m DTM). The slope gradients for the Site are illustrated on **AEI Figure 10.1.5**.

Hazard rankings at each probe point were determined by assigning coefficients based on peat depth, slope gradient and substrate material as outlined in Section 5.4.

The other factors have not been assigned coefficients but have nonetheless been built into the assessment. In regard to hydrology, major and minor watercourses are assigned different coefficients to reflect the sensitivity of the receptor with the distance of each probe from a watercourse affecting its hazard ranking.

No existing peat instability was recorded at the Site, however in the event that slip material is recorded at a probing point, this is fed into the hazard assessment and the highest substrate coefficient is assigned to reflect the highest potential level of hazard.

Vegetation plays a key role on both peatland quality and in reducing the risk of instability in peatland. Vegetation provides structure to the upper soil horizons and acts as an important regulator of water content in peat above the water table. The presence of bare or eroded peat can be an indicator of instability risk due to the lack of vegetation providing stability. No bare peat and only limited areas of eroded peat have been recorded on the Site. The presence of forestry and requirement for felling can also present a risk of instability due to the removal of established root systems and resulting lack of vegetation. There are no forestry areas within the Site boundary and therefore, no felling requirements. It is therefore deemed that there will not be an increased peat slide risk as a result of vegetation clearance. Further details of vegetation present at the Site are discussed in **Chapter 7, Ecology of the AEI Report** and the associated Technical Appendices.

Due to the nature of the assessment and number of data points used to establish hazard ranking, gathering hydrological data at each probe point through the use of groundwater boreholes and a subsequent monitoring period is considered impractical. Therefore, an assumption on groundwater levels has been adopted for the assessment that 90% of the peat at each probe location is below the water table. As such, it is assumed that the water table across the Site is relatively high.

5.4 HAZARD RATING

When several factors may impact on the Hazard potential, a relative ranking process is applied attributing different weighting to each factor as shown below.

TABLE 3 - COEFFICIENTS FOR SLOPE GRADIENTS

Slope Angle (degrees)	Slope Angle Coefficients
Slope < 2°	1
2° < Slope < 4°	2
4° < Slope < 8°	4
8° < Slope < 15°	6
Slope >15°	8

TABLE 4 - COEFFICIENTS FOR PEAT THICKNESS AND GROUND CONDITIONS

Peat Thickness	Ground Conditions Coefficients
Peaty or organic soil (<0.5m)	1
Thin Peat (0.5 – 1.0m)	2
Deep Peat (>1.0m)	3*
Deep Peat (>3.0)	8

* - Note that thicker peat generally occurs in areas of shallow gradient and records indicate that thick peat does not generally occur on the steeper gradients.

TABLE 5 - COEFFICIENTS FOR SUBSTRATE

Substrate Material	Substrate Coefficients
Sand/gravel	1
Rock	1.5
Clay	2
Not proven	2
Slip material (Existing materials)	5

The Hazard Rating Coefficient for a particular location is calculated using the following equation:

Hazard Rating Coefficient = Slope Gradient x Peat Thickness x Substrate

From the Hazard Rating Coefficient, the risk to stability can be ranked as set out in **Table 6**.

TABLE 6 - HAZARD RATING

Hazard Rating Co-efficient	Potential Stability Risk (Pre-Mitigation)
<5	Negligible
5 to 15	Low
16 to 30	Medium
31 to 50	High
> 50	Very High

5.5 PEAT STABILITY ASSESSMENT

The likelihood of a particular slope or hillside failing can be expressed as a Factor of Safety. For any potential failure surface, there is a balance between the weight of the potential landslide (driving force or shear force) and the inherent strength of the soil or rock within the hillside (shear resistance).

The stability of a slope can be assessed by calculating the factor of safety F, which is the ratio of the sum of resisting forces (shear strength) and the sum of the destabilising forces (shear stress):

$$F = \frac{c' + (\gamma - m\gamma_w) z \cos^2 \beta \tan \phi'}{\gamma z \sin \beta \cos \beta}$$

Where c' is the effective cohesion, γ is the bulk unit weight of saturated peat, γ_w is the unit weight of water, m is the height of the water table as a fraction of the peat depth, z is the peat depth in the direction of normal stress, β is the angle of the slope to the horizontal and ϕ' is the effective angle of internal friction. Values of F < 1 indicate a slope would have undergone failure under the conditions modelled; values of F > 1 suggest conditions of stability.

In the absence of any historical hydrological monitoring, an assumption on groundwater levels has been adopted for the assessment, that 90% of the peat column at each probe location is below the water table, an overall conservative approach. While the assessment considers the recorded data at each of the peat probes to establish hazard ranking for the purposes of the peat stability analysis, groundwater depth is conservatively assumed to be within close proximity of the surface, based on the understanding of peat and its hydrological properties that it can consist of up to 90% water by volume.

Peat failures occur due to a combination of pre-existing factors including the morphological, geomorphological, hydrological, and geological and trigger factors. Trigger factors could include heavy rainfall events, the loading of the peat, and excavation of the peat. Peat slides occur when a mass of peat moves as an intact body down a slope. Slides generally occur on a shear plane, usually located close to the base of the peat. The dominant failure method in peat failures looked at by Boylan et al (2008) in Ireland was planar failure as opposed to bog bursts.

5.5.1 GEOTECHNICAL PARAMETERS

Peat possesses significant shear strength considering that it can consist of moisture contents of more than 900%. This can be attributed to the small amounts of solid plant matter present within the peat. Water within peat is held in three states, free water within cavities in the soil matrix, capillary water within plant matter and adsorbed water bound to soil particles. Most of the water is held in the soil cavities and can therefore be removed by drainage or consolidation. The hydrological properties of peat play a significant role in the failure of peat (Boylan et al [2008]).

Assumed geotechnical parameters have been utilised in the formula to inform the stability assessment, based on literature values to inform the stability analysis, as included in Table 7.

TABLE 7 - LITERATURE FOR GEOTECHNICAL PARAMETERS OF PEAT

Reference	Effective Cohesion C′ (kPa)	Effective Angle of Friction ϕ (°)	Unit Weight ϒ (kN/m2)	Comments
Hanrahan et al (1967)[25]	5.5 – 6.1	36.6 – 43.5	-	Remoulded H4 Sphagnum peat
Hollingshead and Raymond (1972)[26]	4.0	34	-	-
Hollingshead and Raymond (1972)	2.4 – 4.7	27.1 – 35.4	-	Sphagnum peat (H3, mainly fibrous)
Carling (1986)[27]	6.52	0	10	-
Kirk (2001)[28]	2.7 – 8.2	26.1 – 30.4		Ombrotrophic blanket peat
Warburton et al (2003)[29]	5.0	23	9.68	Basal Peat
Warburton et al (2003)	8.74	21.6	9.68	Fibrous Peat
Dykes and Kirk (2006)	3.2	30.4	9.61	Acrotelm
Dykes and Kirk (2006)	4.0	28.8	9.71	Catotelm

C′ – effective cohesion (kPa), typically ranging from 2.5 to 8.5 therefore **5.0** has been adopted for the purposes of the assessment.

ϕ – effective angle of friction (°), typically ranging from 21.6 to 43.5 therefore **23** has been adopted for the purposes of the assessment.

[25] Hanrahan et al (1967) - Hanrahan, E.T., Dunne, J.M., and Sodha, V.G. 1967. Shear strength of peat. Proceedings Geotechnical Conference, Oslo, Vol. 1, pp. 193–198.
[26] Hollingshead and Raymond (1972) - Hollingshead, G.W., and Raymond, G.P. 1972. Field loading tests on Muskeg, Canadian Geotechnical Journal, 9(3): 278–289.
[27] Carling (1986) - Peat slides in Teesdale and Weardale, northern pennines, September 1983: Description and failure mechanisms
[28] Kirk (2001) - Initiation of a multiple peat slide on Cuilcagh Mountain, Northern Ireland
[29] Warburton et al (2003) - Anatomy of a Pennine peat slide, Northern England

Y – unit weight (kN/m2), typically ranging from 9.61 to 10, therefore **10** has been adopted for the purposes of the assessment.

m - the height of the water table as a fraction of the peat depth, is assumed as 90% of the peat column as described in Section 5.3.

In accordance with the best practice method, F values of <1.0 indicate slopes that would experience failure under the modelled conditions and as such are considered areas of high risk. However, Boylan et al (2008) indicate that a relatively high value of F=1.4 should be used to identify slopes with the potential for instability. Adopting a similar and more onerous approach, high risk areas are indicated where F is <1.0, medium risk areas are indicated between 1.01 to 1.50, and low risk >1.50.

According to Boylan et al (2008), it is unlikely that undrained conditions would exist for many in situ tests due to the higher permeability of peat as compared to clay soils. They found that the application of both drained and undrained analysis in peat failure analysis are questionable. Furthermore, they found that the mode of failure for peat is likely partially drained. Due to this the effective stress strength method (assuming steady seepage of groundwater parallel to ground level) was used with the abovementioned mitigation measure of increasing the F value where slip occurs.

Using digital terrain modelling and GPS co-ordinates of each peat probe, a factor of safety, F has been calculated for each probe location which has been created through ArcGIS Pro Spatial Analyst tools. The 'Factor of Safety Plan' is shown on **AEI Figure 10.1.6**.

5.6 EXPOSURE ASSESSMENT

The main Exposure receptors identified within the Site and surrounding area which could potentially be affected in the event of a peat slide were existing windfarm infrastructure, blanket bog habitats, existing tracks, watercourses and associated tributaries.

The impact of a peat slide on receptors can be assessed on a relative scale based on the potential for loss of habitat, a historical feature or disruption/danger to the public. To effectively assess the impact, the assessment of Exposure effect must also consider the distance between the hazard and the receptor, and the relative elevation between the two.

The Factor of Safety (FOS) analysis completed on the probes from the Phase 2 probing indicated that there is a high risk of failure for one point in the vicinity of the deeper peat on a steep slope. There are four points that have a medium risk of failure, two of which are located close to the high risk point. All of the high and medium risk points are located in areas that have deep peat and have steep slopes, some of which are located on the access track between turbines 3 and 4, and two other points located away from the proposed Site infrastructure. These points are displayed on **AEI Figure 10.1.6, Factor of Safety Plan.**

Although the FoS analysis returned these high and moderate risk values on the track, the Hazard Ranking Assessment returned these points to be low risk. The Hazard Ranking Assessment is more comprehensive than the FoS analysis as it includes all of the variables considered by the FoS analysis as well as other variables. Due to the low Hazard Ranking values, the risks of peat slide occurring are not considered significant, but mitigation measures will be implemented.

The use of floating tracks in this area of deep peat will be implemented which will minimise peat disturbance (although not minimise risks of slides) and following further investigation, there will be an opportunity for the points to be microsited if necessary. Mitigation measures will also be implemented such as visual inspections and monitoring during construction in areas with the potential for peat slide risk. Best practice measures relating to drainage of the peat will also be implemented prior to and during construction in order to mitigate the risk of failure.

5.7 EXPOSURE RATING

Similar to the Hazard Rating, the Exposure Ratings were determined using relative ranking process by attributing the different weighting systems to each factor as shown below. All of the receptor types were included in the assessment, although all of the receptor types may not be visible in the final assessment, where they are not the closest receptor for any of the probing points.

TABLE 8 - COEFFICIENTS FOR RECEPTOR TYPE

Receptor	Receptor Coefficients
Road, path or track	3
Minor water feature	6
Site infrastructure	3
Dwelling	6
Major water feature	8
Sensitive Habitat	8

TABLE 9 - COEFFICIENTS FOR DISTANCE FROM RECEPTOR

Distance from Receptor	Distance Coefficients
> 1 km	1
100 m to 1 km	2
10 m to 100 m	3
<10 m	4

TABLE 10 - COEFFICIENTS FOR RECEPTOR ELEVATION

Receptor Elevation	Elevation Coefficients
< 10 m	1
10 m to 50 m	2
50 m to 100 m	3
> 100 m	4

The Exposure Rating Coefficient for a particular location is calculated using the following equation:

Exposure Rating Coefficient = Receptor x Distance x Elevation

From the Hazard Rating Coefficient, the risk to stability can be ranked as set out in **Table 11**.

TABLE 11 - EXPOSURE RATING

Exposure Rating Co-efficient	Potential Stability Risk (Pre-Mitigation)
<6	Very Low
7 to12	Low
13 to 24	High
25 to 30	Very High
>30	Extremely High

5.8 RATING NORMALISATION

In order to achieve an overall Hazard Ranking in accordance with the Scottish Government Guidance, the Hazard and Exposure Rating Coefficient derived from the coefficient tables are normalised as shown in **Table 12**.

TABLE 12 - RATING NORMALISATION

Hazard Rating		Exposure Rating	
Current Scale	**Normalised Scale**	**Current Scale**	**Normalised Scale**
< 5 Negligible	1	<6 Very Low	1
5 to 15 Low	2	7 to 12 Low	2
16 to 30 Medium	3	13 to 24 High	3

Hazard Rating		Exposure Rating	
31 to 50 High	4	25 to 30 Very High	4
>50 Very high	5	>30 Extremely High	5

The record of the Hazard Rank Assessment is included in Appendix C of this report.

6. HAZARD RANKING

Having identified the rating coefficients as defined in Section 5 of this report, it is possible to categorise areas of the Site with a Hazard Ranking by multiplying the Hazard and Exposure Rating. Hazard Ranking and associated suggested actions matrix are shown in **Table 13** and Table 14 below:

TABLE 13 - HAZARD RANKING AND SUGGESTED ACTIONS

Hazard Ranking		**Action Suggested in the Scottish Executive Guidance**
17-25	High	Avoid project development at these locations.
11-16	Medium	Project should not proceed unless hazard can be avoided or mitigated at these locations, without significant environmental impact, in order to reduce hazard ranking to low or less
5-10	Low	Project may proceed pending further investigation to refine assessment. Mitigation of hazards maybe required through micro-siting or re-design at these locations.
1-4	Negligible	Project should proceed with monitoring and mitigation of peat landslide hazards at these locations as appropriate.

TABLE 14 - HAZARD RANKING MATRIX

Hazard Rating	5	Low	Low	Medium	High	High
	4	Negligible	Low	Medium	Medium	High
	3	Negligible	Low	Low	Medium	Medium
	2	Negligible	Negligible	Low	Low	Low
	1	Negligible	Negligible	Negligible	Negligible	Low
		1	2	3	4	5
		Exposure Rating				

Receptor exposure was assessed for each hazard zone using the approach in Section 5. A summary of the Hazard Ranking result for each identified area is summarised in **Table 15** and is presented in **AEI Figure 10.1.7 'Hazard Ranking Zonation Plan'**.

7. SLIDE RISK AND MITIGATION

7.1 GENERAL

The PSRA has shown the majority of the Site to be of a Negligible risk with isolated points that are of low risk for peat slide. There are two points on the Site that are classified as medium risk for a peat slide, these points fall within a blanket bog but are not located close to potential Site infrastructure. The majority of the Low risk points fall outside of the development area, but there are isolated points that are located on the tracks themselves. The Hazard Risk Plan for the Revised Development is shown in **AEI Figure 10.1.7** and it demonstrates the zones of low and negligible risk for the Revised Development.

Further to the hazard areas, a FoS assessment has been undertaken, which provides a sense check of the ranking based system as outlined in Section 5.5 of this PSRA. The 'Factor of Safety Plan' is shown in **AEI Figure 10.1.6** and demonstrates that the majority of the Site is located in areas with low risk of failure. There is one point with a FoS lower than 1 which indicates failure. This point is located on the track beneath the hardstanding of turbine 4. This point is located on a steep slope within a wet area with deep peat. In addition to this point indicating failure there are five points that indicate medium risk of failure. Three of these points are close to the high risk point, while the remaining two medium points are located in areas away from proposed infrastructure.

Nonetheless, a risk of peat slide may still exist and mitigation measures as outlined in Section 7.3 of this PSRA shall be applied to minimise any risk.

Where the hazard ranking has been lowered through mitigation measures, the original ranking will remain in the overall hazard zoning plan and it should be acknowledged that the hazard zonation plan is based on the pre-mitigation status.

While the specific recommended mitigation in low ranked areas is proposed, other mitigation is embedded in the design at EIA stage. It is also necessary for detailed design and construction of the Revised Development infrastructure to be undertaken in a competent and controlled manner.

The embedded mitigation and good practice measures are set out in Section 7.2 and 7.3 of this PSRA. It should be noted that the mitigation measures defined are not exclusive and other forms of mitigation may well be required and should be implemented during construction of the Revised Development.

Table 15 provides details of the hazard areas and outlines specific mitigation actions for each area.

TABLE 15 - HAZARD RANK

Hazard Area and Infrastructure		**Unmitigated Hazard**		**Mitigated Hazard**	
Hazard Area	**Infrastructure Affected**	**Ranking**	**Key Aspects**	**Specific Actions**	**Ranking**
H1	Turbines 1,2,3, and 6, a portion of T4 hardstanding and associated tracks	Low	Location: South-western portion of the Site. Isolated points along the tracks, and three points beneath T1 that have a low hazard ranking. While there are two points with peat depths greater than 4 m. Hydrology: There are a few minor watercourses that run through this zone. Peat Depth: 0.00 m – 5.00 m. Generally, <1.00 m Slope Gradient: 0° to >15° Exposure: Proposed infrastructure and minor watercourses	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP.** Micro-siting into areas of thinner peat where required. During construction visual inspections and monitoring in areas with the potential for peat slide risk shall take place.	Low

Hazard Area and Infrastructure		**Unmitigated Hazard**		**Mitigated Hazard**	
H2	No site infrastructure	Low	Location: The western portion of the Site. Hydrology: There are a few minor watercourses that run through this zone. Peat Depth: 0.00 m – 1.50 m. Generally, <1.00 m Slope Gradient: 0° to <15° Exposure: Minor watercourses	No Site infrastructure is located within this hazard zone. This area will not be disturbed. During construction, visual inspections and monitoring shall take place in areas with the potential for peat slide.	Negligible
H3	Access Tracks, T7 and T9	Low	Location: The central portion of the southern area of the Site. There are isolated points of low risk of peat slide located on the access track. These are mostly located in areas of deeper peat or on steep slopes. Hydrology: There are a few minor watercourses that run through this zone. Peat Depth: 0.00 m – 2.90 m. Generally, <1.00 m Slope Gradient: 0° to >15° Exposure: Proposed infrastructure, sensitive habitat and minor watercourses	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP**. Micro-siting into areas of thinner peat where required. During construction visual inspections and monitoring in areas with the potential for peat slide risk shall take place.	Negligible
H4	Access Track, T5, T10 and a portion of T4,	Negligible	Location: south-western portion of the central Site. Hydrology: There are a few minor watercourses that	Best practice measures in relation to drainage prior to and during construction will be implemented	Negligible

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
			run through this zone. Peat Depth: 0.00 m – 2.40 m. Generally, <1.00 m Slope Gradient: 0° to >15° Exposure: Proposed infrastructure and minor watercourses	as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP.** Micro-siting into areas of thinner peat where required. During construction visual inspections and monitoring in areas with the potential for peat slide risk shall take place.	
H5	Access track, BESS, substation and borrow pit.	Negligible	Location: Majority of eastern and central portions of main site area. Hydrology: There are a few minor and major watercourses that run through this zone. Peat Depth: 0.00 m – 2.90 m. Generally, <1.00 m Slope Gradient: 0° to >15° Exposure: Proposed infrastructure, sensitive habitat and minor watercourses	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP.** Mechanical excavation only in the borrow pit area.	Negligible
H6	No site infrastructure	Low	Location: Eastern portion of the Site. No Site infrastructure is located within this hazard zone. Hydrology: There are a few minor watercourses that run through this zone. Peat Depth: 0.00 m – 1.80 m.	No Site infrastructure is located within this hazard zone. This area will not be disturbed.	Negligible

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
			Generally, <1.00 m Slope Gradient: 0° to >15° Exposure: Minor watercourses		
H7	New access track.	Low	Location: north eastern portion of the Site. Hydrology: There are a few minor watercourses that run through this zone. Peat Depth: 0.00 m – 0.3 m. Slope Gradient: 0° to <15° Exposure: Minor watercourses	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP**. Micro-siting into areas of thinner peat where required. During construction visual inspections and monitoring in areas with the potential for peat slide risk shall take place.	Negligible
H8	Access Tracks and T11.	Medium	Location: Central portion of the site. There is a blanket bog located beneath these points and no site infrastructure located in the area surrounding these points. Hydrology: There are no watercourses in this area. Peat Depth: 0.00 m – 4.80 m. Slope Gradient: 0° to <10° Exposure: Sensitive habitat	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP**. A Geotechnical Risk Register should be completed as part of the	Low

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
				design phase and geotechnical supervision should be provided throughout the construction phase. During construction visual inspections and monitoring in areas with the potential for peat slide risk should take place. Placement of excavated materials on slopes should be avoided with all excavated materials placed in temporary storage mounds positioned at safe slope gradients and certified by a geotechnical engineer. Use of heavy plant machinery on slopes should be avoided where possible to minimise loading of slopes. All earthworks and excavations should be designed and undertaken in such a way as to avoid any excavation of toe support material.	

Hazard Area and Infrastructure		**Unmitigated Hazard**		**Mitigated Hazard**	
				Micro-siting into areas of thinner peat where possible.	
H9	New access track.	Medium	Location: south western boundary the Site. Hydrology: There are no watercourses that run through this zone. Peat Depth: 0.00 m – 1.5 m. Slope Gradient: 0° to <15° Exposure: Sensitive habitat	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP**. A Geotechnical Risk Register should be completed as part of the design phase and geotechnical supervision should be provided throughout the construction phase. During construction visual inspections and monitoring in areas with the potential for peat slide risk should take place. Placement of excavated materials on slopes should be avoided with all excavated materials placed in temporary storage mounds positioned at	Low

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
				safe slope gradients and certified by a geotechnical engineer. Use of heavy plant machinery on slopes should be avoided where possible to minimise loading of slopes. All earthworks and excavations should be designed and undertaken in such a way as to avoid any excavation of toe support material. Micro-siting into areas of thinner peat where possible.	
H10	New access track.	Medium	Location: West of the central portion of the site. Hydrology: There are no watercourses that run through this zone. Peat Depth: 0.00 m – 2.0 m. Slope Gradient: 0° to <8° Exposure: Sensitive habitat	Best practice measures in relation to drainage prior to and during construction will be implemented as well as the management of peat and peaty soils as outlined in **Appendix 10.2 oPMP**. A Geotechnical Risk Register should be completed as part of the design phase and geotechnical supervision should be provided throughout the	Low

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
				construction phase. During construction visual inspections and monitoring in areas with the potential for peat slide risk should take place. Placement of excavated materials on slopes should be avoided with all excavated materials placed in temporary storage mounds positioned at safe slope gradients and certified by a geotechnical engineer. Use of heavy plant machinery on slopes should be avoided where possible to minimise loading of slopes. All earthworks and excavations should be designed and undertaken in such a way as to avoid any excavation of toe support material. Micro-siting into areas of thinner peat where possible.	
H11	No site infrastructure.	Medium	Location: west of the southern upland way.	T8 has been removed and no further site	Low

Hazard Area and Infrastructure		Unmitigated Hazard		Mitigated Hazard	
			There is a blanket bog located beneath these points and no site infrastructure located in the area surrounding these points. Hydrology: There are no watercourses in this area. Peat Depth: 0.00 m – 2.00 m. Slope Gradient: 0° to <15° Exposure: Sensitive habitat	infrastructure is located within this hazard zone. This area will not be disturbed.	

7.2 EMBEDDED MITIGATION

Embedded mitigation includes measures taken during design of the Revised Development to reduce the potential for peat slide risk. In summary, the principal measures that have been taken are:

- Locating infrastructure on shallower slopes, where possible; and
- Locating infrastructure on areas of shallow peat (or no peat) where possible.
- Where access tracks could not be located on areas of peat shallower than 1 m, floating access tracks are proposed. **AEI Figure 10.2.4** in Appendix A of **Appendix 10.2, Outline Peat Management Plan of the AEI Report** shows the proposed locations for these areas.

7.3 PEAT SLIDE MITIGATION RECOMMENDATIONS

The following mitigation measures should be adopted post consent stage to validate the PSRA and influence the detailed design of the Revised Development:

- Ground investigations prior to detailed design;
- Identification of areas sensitive to changes in drainage regime prior to detailed design;
- Update the PSRA as necessary following detailed ground investigations;
- Development of a drainage strategy that will not create areas of concentrated flow and will not affect the current peatland hydrology, particularly in areas where a medium or high peat slide risk has been identified;
- Design of a Development drainage system for tracks and hardstanding that will require minimal ongoing maintenance during the operation of the windfarm;
- Inspection and maintenance of the drainage systems during construction and operation;
- Identification of suitable areas for stockpiling material during construction prior to commencement of works; and

- Consideration of specific construction methods appropriate for infrastructure in peatland (i.e. geogrids) as part of design development.

8. CONCLUSIONS

This PSRA has been undertaken for the Revised Development in accordance with the Scottish Government guidance, as outlined in Section 3 of this PSRA. The early stages of the assessment included a desk study, historic peat probing across the site, followed by further intensive probing targeting the finalised Site layout design. The information gathered during this investigation was used to develop a Hazard Ranking across the Site.

The findings of the probing indicate that there are areas on site with deeper peat, but that the majority of the site does not have peat with depths greater than 1 m. There is a risk of peat slide on the site in terms of the FoS analysis that was done – these risks can be mitigated through construction monitoring, proper drainage, and micrositing where required.

Based on the scope of the study, the PSRA has indicated that the Site is generally of negligible hazard ranking. There are points that have low and medium hazard rankings, but these points can be mitigated. It is considered that following the implementation of mitigation measures outlined in **Table 15** and Section 7.3 of this PSRA, the maximum residual hazard posed to the Revised Development will be low/negligible.

Notwithstanding this, infrastructure locations and existing site conditions should be checked on Site at the time of construction and micro-siting adopted in order to maintain the design objective of avoiding any potential peat slide risk.

APPENDIX A FIGURES

APPENDIX B SITE PHOTOGRAPHS

The Site Photographs are included below. A map showing the locations where these photographs were taken can be viewed in Appendix A as AEI Figure 10.1.8, Site Photograph Locations.

Image 1: The hilly nature of the Site shown from the westernmost turbine

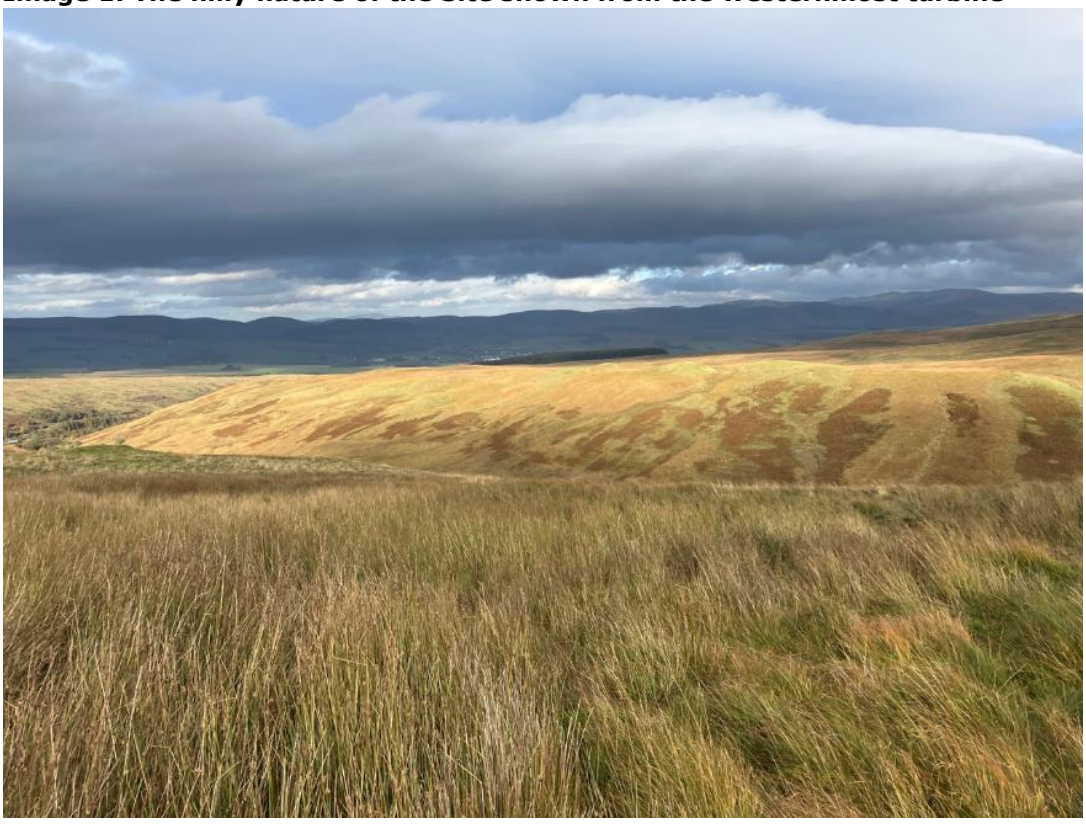

Image 2: Central portion of the Site

Image 3: View from the central portion of the Site

Image 4: Existing quarry on the Site which is also the potential location for Borrow Pit 1

APPENDIX C HAZARD RANK ASSESSMENT RECORDS

ERM HAS OVER 160 OFFICES ACROSS THE FOLLOWING COUNTRIES AND TERRITORIES WORLDWIDE

Argentina
Australia
Belgium
Brazil
Canada
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
The Netherlands
New Zealand
Peru
Poland
Portugal
Romania
Senegal
Singapore
South Africa
South Korea
Spain
Switzerland
Taiwan
Tanzania
Thailand
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UK
US
Vietnam

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Environmental Resources Management Limited
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APPENDIX 10.2 OUTLINE PEAT MANAGEMENT PLAN

Cloud Hill Wind Farm

Appendix 10.2 Outline Peat Management Plan

PREPARED FOR

BayWa r.e.

DATE
24 October 2024

REFERENCE
0740609

CONTENTS

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

Acronym	Description
AEI	Additional Environmental Information

Acronym	Description
BESS	Battery Energy Storage System
ECU	Energy Consents Unit
EIA	Environmental Impact Assessment
oPMP	Outline Peat Management Plan
PLHRA	Peat Landslide Hazard Risk Assessment
PSRA	Peat Slide Risk Assessment
SEPA	Scottish Environment Protection Agency
SR	Scottish Renewables
T	Turbine

1. INTRODUCTION

1.1 BACKGROUND

This updated outline Peat Management Plan (oPMP) has been prepared by ERM Ltd to assess the estimated peat excavation and re-use potential as well as the proposed peat and soil management methodologies to be employed during the construction of Cloud Hill Wind Farm (the Revised Development).

The oPMP has been prepared as a technical appendix to the AEI Report and should be read in conjunction with **Chapter 10, Geology and Peat of the AEI Report** and **Appendix 10.1, Peat Slide Risk Assessment (PSRA) of the AEI Report**. The oPMP will ensure that the construction of the Revised Development will comply with good practice in accordance with Scottish Renewables (SR) and Scottish Environment Protection Agency (SEPA) guidance[1].

The purpose of the oPMP is to:

- Define the materials that will be excavated during the construction of the Revised Development, focussing specifically on the excavation of peat;
- Report on detailed investigations into peat depths during within the Revised Development, including peat probing and coring results;
- Detail proposals for the management of excavated peat and other soils;
- Consider the potential effect of the Revised Development on Ground Water Dependent Terrestrial Ecosystems (GWDTEs);
- Determine volumes of excavated peat at the Site and proposals for re-use or reinstatement using excavated materials;
- Assess the potential for peatland restoration at the Site, and;
- Provide details of general and specific mitigation measures.

The oPMP has been produced in accordance with SR and SEPA guidance on peat excavations and management[2]. It is expected that this document will evolve throughout the different phases of the Revised Development and will therefore be subject to continued review to address:

- Requirements to adhere to future planning conditions;
- Detailed ground investigations and design development;
- Unforeseen conditions encountered during construction;

[1] SR and SEPA (2012) Guidance on the Assessment of Peat volumes, Re-use of Excavated Peat and the Minimisation of Waste [Online] Available at: Guidance+on+the+assessment+of+peat+volumes%2C+reuse+of+excavated+peat%2C+and+the+minimisation+of+waste.pdf (www.gov.scot) (Accessed 16/05/23)

[2] SR and SEPA (2012) Guidance on the Assessment of Peat volumes, Re-use of Excavated Peat and the Minimisation of Waste [Online] Available at: Guidance+on+the+assessment+of+peat+volumes%2C+reuse+of+excavated+peat%2C+and+the+minimisation+of+waste.pdf (www.gov.scot) (Accessed 16/05/23)

- Changes in best practice during the life of the wind farm, and;
- Changes resulting from the construction methods used by the contractor(s).

Whilst this oPMP provides a base standard for good practice, the contractor will implement any methods or improvements to current practices which will avoid or minimise risks to the environment, where possible, and will correspond with SEPA.

The oPMP is accompanied by the following appendices:

- Appendix A – Figures, and;
- Appendix B – Excavation and Re-use Volumes and Calculations.

1.2 THE SITE

The Site is approximately 4.5 km South of Sanquhar, Dumfries and Galloway, while the entrance to the Site is 0.5 km South-West of the town. The Site is centred on NGR 274802, 606254 and the total area within the Site boundary is approximately 805 hectares (ha).

The operational Whiteside Hill Wind Farm is located approximately 1.6 km southwest of the Site and the operational Twentyshilling Hill Wind Farm is approximately 4.2 km to the southeast. In addition, there are also the nine turbines of Sanquhar Wind Farm to the north, and Hare Hill and Extension further north-west. Although comprising only two turbines at 62 m, there is also Sunnyside Farm on the northern side of Sanquhar. The topography of the Site and immediate vicinity is complex, with elevation ranging from approximately 150 m Above Ordnance Datum (AOD) in the north-east part of the Site to approximately 470 m AOD in the south-east of the Site, at the summit of Corridow Hill. There are a number of other hills within the Site including:

- Mid Rig (437 m AOD) located in the east of the Site;
- Cloud Hill (451 m AOD) located in the south of the Site; and
- Whing Head (456 m AOD) located in the south of the Site.

There are a number of watercourses dissecting the aforementioned hills within the Site; watercourses within the Site include Whing Burn, Glenmaddie Burn, Glen Burn, and Glenlarie Burn as well as several other smaller burns.

1.3 THE REVISED DEVELOPMENT

The Revised Development comprises of the following main components:

- 10 three-bladed wind turbines with a maximum tip height of up to 180 m, rotor diameters of approximately 150 m and hub heights of approximately 105 m, and associated foundations and hardstanding areas;
- Network of underground cabling;
- A permanent met mast ;
- Access tracks linking the turbine locations;
- Substation Compound measuring approximately 100 m by 75 m including a Control Building and associated external electrical switchgear with welfare facilities, associated electrical plant and equipment, security fencing and wastewater holding tank;

- A Battery Energy Storage System (BESS) site will be located south of the substation;
- Temporary Construction Compound;
- 3 borrow pits for aggregate extraction;
- Upgraded site access

The layout of the Revised Development has evolved for the AEI following the submission of the EIA report with details of the final layout provided in **Chapter 4, Revised Development Description.**

The Site layout is displayed in **AEI Figure 10.2.1, Revised Development Site Layout Plan**.

1.4 CONSULTATION

Peat excavation and disturbance within the Site, as well as the reinstatement and restoration potential, were considered throughout the EIA for the Original Development and the outcomes of studies are reported in the EIA Report. The EIA Report forms part of the s36 application submitted to the Scottish Government's Energy Consent Unit (ECU) and made available to all consultees, including SEPA.

2. OBJECTIVES

2.1 INTRODUCTION

Desk-based assessments, detailed peat survey work and completion of technical assessments such as **Appendix 10.1, Peat Slide Risk Assessment (PSRA) for the AEI Report** allows a consistent approach for managing peat.

The preparation of an oPMP is in response to the 2022 Scoping Responses (April 2022 – June 2022), Gatecheck Report (issued January 2023), as well as the intent to deliver a construction project that complies with good practice in accordance with SR and SEPA.

The oPMP has been updated with additional survey data and the following changes have been made to the scope of assessment since the Original Development. The Revised Development comprises:

- The relocation of Turbine 1 (T1) (from E:272661, N:604825 to E:272702, N:605026)
- Removal of Turbine 8 (T8); and,
- Relocation of Substation / BESS Compound.

In addition to the technical assessments, an outline civil design of the Site has been undertaken. The overall objective in the design of the Revised Development has been to minimise the excavation and disturbance of peat where possible. The access tracks and turbines have been placed in areas of shallower peat as far as possible.

The objective of the oPMP is achieved by:

- Ensuring the characteristics of the Site are understood through extensive peat probing and assessing the Site topography;
- Understanding the site layout and how peat will be excavated and stored;
- Modelling the peat depth profile based on probing and a digital terrain modelling in 3D;
- Considering the best practice guidance for peat reinstatement, and;

- Developing practical peat restoration opportunities for the improvement of habitats and peatlands.
- The oPMP has been compiled in accordance with the following best practice guidance:
- Guidance on Developments on Peatland: Peatland Survey (2017) 3;
- Guidance on Developments on Peatland: Guidance on the Assessment of Peat Volumes, Re-use of Excavated Peat and Minimisation of Waste4;
- Floating Roads on Peat Guidance5;
- Good Practice During Wind Farm Construction6; and
- SEPA Regulatory Position Statement – Developments on Peat[7].

2.2 APPROACH TO MINIMISING PEAT EXCAVATION

The following steps have been taken during the outline design stage of the Revised Development to minimise the effect on peat:

- The development of an access track design which avoids deeper peat where practicable;
- The development of an access track design that uses existing tracks where possible, where gradients permit, can be floated through sections where peat is 1.0 m or greater;
- The design and orientation of turbines and crane hardstandings considers local topography, deep peat and other environmental constraints; and
- Consideration of a borrow pit location in an area of shallow peat cover.
- These steps will be further supplemented by taking the following measures to minimise disturbance:
- Maximisation of batter angles in cuttings;
- Utilisation of existing access tracks, and;
- The use of appropriate construction plant to avoid unnecessary disturbance of the ground surface (e.g. low ground pressure excavators).

[3]SNH (2017) Guidance on Developments on Peatland: Peatland Survey (2017) [Online] 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 (Accessed 16/05/2023)

[4] Scottish Renewables & SEPA (2012) Developments on Peatland: Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste [Online] Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2014/07/assessment-of-peat-volumes-reuse-of-excavated-peat-and-minimisation-of-waste-guidance/documents/guidance-on-the-assessment-of-peat-volumes-reuse-of-excavated-peat-and-the-minimisation-of-waste/guidance-on-the-assessment-of-peat-volumes-reuse-of-excavated-peat-and-the-minimisation-of-waste/govscot%3Adocument/Guidance%2Bon%2Bthe%2Bassessment%2Bof%2Bpeat%2Bvolumes%252C%2Breuse%2Bof%2Bexcavated%2Bpeat%252C%2Band%2Bthe%2Bminimisation%2Bof%2Bwaste.pdf (Accessed 06/06/2023)

[5] SNH (2010) Floating Roads on Peat [Online] Available at: http://www.roadex.org/wp-content/uploads/2014/01/FCE-SNH-Floating-Roads-on-Peat-report.pdf (Accessed 06/06/2023)

[6] Scottish Renewables et al. (2019) Good Practice during Wind Farm Construction [Online] Available at: Guidance - Good practice during Wind Farm construction | NatureScot (Accessed 06/06/2023)

[7] SEPA (2010) SEPA Regulatory Position Statement – Developments on Peat [Online] Available at: https://www.sepa.org.uk/media/143822/peat_position_statement.pdf (Accessed 06/06/2023)

This oPMP is based upon the fundamental principle that achieving a successful materials strategy is contingent on gaining a thorough understanding of the Site through investigation and developing a design that achieves the materials management objectives. For the Revised Development, this principle is achieved by undertaking significant peat probe investigations prior to preparing the outline civil design layout in 3D and the preparation of this oPMP based on the available information.

2.3 AIMS AND OBJECTIVES

2.3.1 NEED FOR A PEAT MANAGEMENT PLAN

Peatlands are considered to be a significant natural resource due to the wildlife habitats that they provide and their ability to absorb carbon, as such they are protected by various legislation, policy and local, national and international initiatives such as:

- United Kingdom Biodiversity Action Plan (UKBAP)[8];
- Scotland's National Peatland Plan (2015)[9];
- Scottish Biodiversity List (SBL)[10];
- Scotland's 2018-2032 Climate Change Plan[11];
- Scottish Soil Framework (2009)[12]; and;
- National Planning Framework 4 (2023)[13].

SEPA has a statutory duty to ensure that where peat spoil is generated during construction, it is stored, re-used, treated or disposed of correctly, which may require authorisation or permits.

SEPA's policy on the management of peat is set out in their SEPA Regulatory Position Statement – Developments on Peat. This highlights that the best management option for peat spoil is the prevention of its production, by seeking to minimise peat excavation and disturbance. Where this is unavoidable, developers should attempt to re-use as much of the peat produced on-site as possible, in justifiable and environmentally beneficial ways.

The oPMP is prepared to demonstrate to local authorities, SEPA and other consultees that the construction of the Revised Development will progress in a manner that is planned, in accordance with good practice and achieves the aim of being environmentally sustainable.

Therefore, the oPMP is prepared in accordance with the SR and SEPA guidance. It details how:

- The Revised Development has been structured and designed to reduce the volumes of peat excavated as far as is reasonably practicable;

[8] Joint Nature Conservation Committee: UKBAP [online] Available at: UK BAP | JNCC - Adviser to Government on Nature Conservation (Accessed 06/06/2023).
[9] NatureScot - Scotland's National Peatland Plan: Working for our future [online] Available at: Scotland's National Peatland Plan: Working for our future | NatureScot (Accessed 06/06/2023)
[10] NatureScot – Scottish Biodiversity List [online] Available at: Scottish Biodiversity List | NatureScot (Accessed 06/06/2023)
[11] Scottish Government – "Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update" [online] Available at: Chapter 6 Land Use, Land Use Change and Forestry - 3.6. Land Use, Land Use Change and Forestry - Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot) (Accessed 06/06/2023)
[12] Scottish Government – "The Scottish Soil Framework" [online] Available at: The Scottish Soil Framework - gov.scot (www.gov.scot) (Accessed 06/06/2023).
[13] Scottish Government (2023) National Planning Framework 4. [online] National Planning Framework 4 (www.gov.scot) (Accessed on 06/06/2023)

- Volumes of peat excavated during construction have been considered in the design, and;
- Excavated peat will be managed.

2.3.2 OBJECTIVES OF THE OPMP

The main objective of the oPMP is to outline how peat and peaty soils proposed to be excavated will be managed and re-used during the construction of the Revised Development and proposed restoration plans.

This is achieved through responding of the following objectives:

- Providing details of the extent and depth of the peat on Site and how this was determined;
- Estimation of peat volumes to be excavated and re-used;
- Classification of excavated materials;
- Consideration of the use of appropriate construction methods;
- Describing how excavated peat will be handled to ensure suitability for re-use;
- Determining if temporary storage of peat will be required during construction and how this will be done to ensure suitability for re-use, and;
- Considering the potential volume of peat which may not be suitable for re-use and any requirement for a Waste Management Plan for the Revised Development.

The response to these objectives is provided within the following sections.

3. PEAT INVESTIGATIONS, EXCAVATIONS, RE-USE AND MANAGEMENT

3.1 PEAT CLASSIFICATION AND PUBLISHED GEOLOGY

3.1.1 GENERAL PEAT CLASSIFICATION

Acrotelmic peat is the upper layer of peat consisting of living and partially decayed materials with a higher hydraulic conductivity and a variable water table. These deposits are generally found to exist in the upper 0.5 m of peat deposits and are typically suitable for reinstatement because they contain viable plant life to assist in the regeneration of peatland vegetation and carbon sequestration.

Catotelmic peat is variable in characteristic, with decomposition of fibres generally increasing with depth. Water content can be highly variable and affects the structural strength of the material. Suitability for re-use generally depends on fibre and water content. The upper catotelm is commonly deemed as being appropriate for use in restoration due to its relatively high fibre content.

Generally, excavated semi fibrous catotelmic peat from the Site will have sufficient structural strength to be able to be used in the lower layers of verge restoration as it will not be ‘fluid’.

The catotelmic peat would be capped with a surface layer of acrotelm to re-establish the peat vegetation. If any fluid like wet catotelmic peat is encountered then it would be placed in more appropriate locations such as low-lying sections of the borrow pits or concave deposition areas.

The following assumptions have been made in classifying peat excavated during the construction work:

- Where the total peat depth was found to be less than 0.5 m, this peat material is assumed to be 100% acrotelmic;
- Where the total peat depth is between 0.5 m and 1.0 m, the upper acrotelmic peat is at least 0.5 m deep; and
- Where the total peat depth is found to be greater than 1.0 m, acrotelmic peat is assumed to account for at least 30% of total depth but generally applying a minimum of 0.5 m thick.

Existing topography and permitted track gradients drive the design of the infrastructure with due consideration given to potential construction risk and effects on environmentally sensitive receptors including deep peat, watercourse buffers and any Groundwater Dependent Terrestrial Ecosystems (GWDTEs). Further micro-siting post-consent would take place in such a way as to avoid where possible the excavation of deep peat.

3.1.2 PUBLISHED GEOLOGY

Published mapping by the BGS also provides information on the bedrock geology present at the Site location. The bedrock geology is identified as being a Kirkcolm formation – Wacke, a sedimentary bedrock, in the West of the Site; whereas the Eastern area of the Site is underlain by a Scottish Lower Coal Measures formation, also a sedimentary formation. The South of the Site sits upon a combination of different sedimentary and igneous rock formations, including Moffat Shale, Portpatrick – Wacke and Crawford Group – Chert.

A reverse or thrust fault runs through the runs across through the centre of the Site from west to east, dissecting the Site.

Published geological mapping presented in the BGS Geology of Britain Viewer[14] and BGS GeoIndex[15] identifies Glacial Till as the soil type covering the majority of the Site area. There are also areas of Glaciofluvial and Alluvial deposits, identified as being Sand, Silt and Gravel, throughout North-eastern areas of the Site.

The carbon and Peatland Map 2016[16] details that there are areas on Site that consist of Class 1, 2, 3, and 5 peat.

3.1.3 INVESTIGATIONS

The existing peat depth across the Site have been determined through a phased survey approach. The survey was initiated to inform the EIA and Site design work while supporting the PSRA. The total number of probes sunk during peat investigations was 1,247.

Phase 1 of the peat depth surveys was carried out in May 2022 by ERM, the results of this survey informed the initial site layout of the Original Development. This survey comprised of a 100 m grid covering the entire Site, where possible. This rationale of probing is in accordance

[14] BGS Geology of Britain Viewer [online] Available at: GeoIndex - British Geological Survey (bgs.ac.uk) (Accessed 06/06/2023)
[15] BGS GeoIndex [online] Available at: GeoIndex - British Geological Survey (bgs.ac.uk) (Accessed 06/06/2023)
[16] Scotland's Environment, Carbon & Peatland 2016. Available at: https://map.environment.gov.scot/Soil_maps/?layer=10 (Accessed 06/06/2023)

with the phase one approach as detailed in the Scottish Government guidance[17] for investigating peat.

Further peat probing was carries out by ERM from 10-14 October and 8 November 2022. The probe locations for this survey were focussed on the proposed turbines, access tracks and other associated infrastructure. Peat depths were measured along the proposed access tracks at 25 m centres with offsets of approximately 25 m on each side of the centre line, at 10 m centres across the proposed turbine locations. Where deeper peat was found close to infrastructure, a higher density of probes has been captured in order to improve effectiveness of micrositing.

The entire section of access track to the Original Development was not probed as the road is existing. Instead the internal bends of the track were probed in order to gain an idea of the peat in these areas in case the track will have to be widened during construction. There will be no construction taking place on this portion of the access track, therefore it was not probed fully as part of the Phase 2 assessment.

Additional field surveys were undertaken to target the revised layout changes proposed (the Revised Development, and including areas proposed for temporary peat storage. In total (including the EIA probing) 3096 probes were sunk. The peat depths are illustrated in **AEI Figure 10.2.2, Recorded Peat Depths** within **Appendix A of this oPMP.**

3.1.4 SUMMARY OF PEAT DEPTHS

Peat depths ranged from 0 m to 5 m depths across the Site. The deeper areas of peat were in isolated areas with only 62 of the 3096 probes confirming peat in excess of 2 m.

An area containing peat in excess of 2 m was identified in the location of the proposed access track between turbine 3 and turbine 4, on a flatter portion of the track located in a fairly hilly area. This area confirmed peat up to depths of 5 m. This area contained grassy vegetation and was located in a wet area. Floating track may be required in order to minimize the excavation of peat.

A second area where peat in excess of 2 m was recorded is at the proposed access track leading to turbine 11, where peat was recorded up to 2.9 m deep. The vegetation in the area was grassy, but located on a flatter slope towards the top of a hill. The access track in this area may require some micrositing to avoid this deeper area of peat.

AEI Figure 10.2.3, Interpolated Peat Depths included within **Appendix A of this oPMP** illustrates the peat depths recorded on Site as well as the distribution of peat deposits along the proposed access tracks and infrastructure.

3.2 EXCAVATION AND RE-USE CALCULATION

Excavated peat volumes have been estimated through the production of a peat levels 3D surface derived from the peat depth data recorded during peat probing. This is compared to a 3D surface developed from the outline civil design of site infrastructure whilst some assumptions have been adopted.

[17] Scottish Government, Scottish National Heritage, SEPA (2017) Peatland Survey. *Guidance on Developments on Peatland*, on-line version only.

The estimated peat excavation volumes are included in Table 1 using the anticipated construction activities that will generate excavated soils.

TABLE 1: PEAT EXCAVATION VOLUMES BASED ON CONSTRUCTION ACTIVITY

Development Component	Estimated Volume of Excavated Peat (m³)	Estimated Volume of Acrotelmic Peat (m³)	Estimated Volume of Catotelmic Peat (m³)
Turbines	16,582	14,290	2,292
Access Tracks	16,302	13,342	2,958
Borrow Pits	12,380	12,380	0
Construction Compound	2,000	2,000	0
BESS	7,390	7,390	0
Substation	1,943	1943	0
SUB-TOTAL	**56,597**	**51,346**	**5,492**
+10% Bulk Factor Contingency	5,659	5,136	549
TOTAL	**62,2257**	**56,481**	**6,041**

A detailed assessment of excavated volumes by location within the Site is provided in Appendix B of this oPMP.

3.2.1 ESTIMATION OF PEAT RE-USE REQUIREMENTS

The principles of reinstating peat and peat soils should be adhered to for all elements of the Revised Development, comprising of the following:

- Peat and peaty soils will be reinstated on access track and infrastructure verges with turves placed on the upper horizons, encouraging revegetation;
- All peat, soil and turves excavated from beneath infrastructure (excluding floated access tracks) will be reinstated in the vicinity of its original location;
- Any wet catotelmic peat will be placed at the bottom of any restoration profile, followed by semi-fibrous catotelmic peat and acrotelmic peat should be placed at the top;
- It is proposed that a large proportion of excavated peat will be utilised in peatland restoration activities in line with the outline techniques discussed in TA 7.6 outline Biodiversity Enhancement Management Plan (oBEMP), and;
- Peatland restoration activities will be overseen by the Environmental Clerk of Works (ECoW) to ensure methods are properly adhered to.

3.2.2 PEATLAND RESTORATION POTENTIAL

The outline objectives in proposing restoration of peatlands on Site are to:

- Ensure residual volumes of excavated peat from the Revised Development are re-used in areas where ecological benefits and maintained or increased carbon sequestration can be delivered;
- Promote the re-use of excavated peat materials and avoid their disposal to landfill;

- Promote use of best practices and guidance to ensure that benefit is made from reusing peat and peaty soils for ecological enhancement, and;
- Complement planned mitigation identified in the oBEMP.

Table 2 shows the opportunities for the re-use of peat within the Site including the demand for acrotelm and catotelm peat, while Table 3 summarises the total peat balance estimated during construction of the Revised Development.

TABLE 2: PEAT RE-USE VOLUMES BASED ON CONSTRUCTION ACTIVITY

Development Area	Total Demand Estimate (m^3)	Acrotelm Demand (m^3)	Catotelm Demand (m^3)	Reinstatement Thickness (max) (m)	Assumptions
Turbines and associated earthworks	6,870	6,870	0	0.5	Turbine and associated earthworks will be dressed off with up to 0.5 m of peat and peaty soils.
New windfarm tracks, turning heads, passing places, existing track upgrades and associated earthworks	24,967	24,967	0	0.5	Where new permanent tracks are proposed, peat will be reinstated along verges and associated earthworks with peat up to 0.5 m thick with verges not expected to exceed 3 m on either side. Average peat depths suggest only acrotelmic peat will need to be reused.
Construction Compound	**2,000**	**2,000**	**0**	**0.5**	Construction Compound area and associated earthworks will be dressed off with an average of 0.5 m of peat and

Development Area	Total Demand Estimate (m³)	Acrotelm Demand (m³)	Catotelm Demand (m³)	Reinstatement Thickness (max) (m)	Assumptions
					peaty soils as the in situ peat depths allow. **Average peat depths suggest only acrotelmic peat will need to be reused.**
Substation	**607**	**607**	**0**	**0.5**	Substation hardstanding area and associated earthworks will be dressed off with up to 0.5 m of peat and peaty soils as the in-situ peat depths allow. Average peat depths suggest only acrotelmic peat will need to be reused.
BESS	**2,173**	**2,173**	**0**	**0.5**	BESS Compound and associated earthworks will be dressed off with up to 0.5 m of peat and peaty soils as the in-situ peat depths allow. Average peat depths suggest only acrotelmic peat will need to be reused.

Development Area	Total Demand Estimate (m³)	Acrotelm Demand (m³)	Catotelm Demand (m³)	Reinstatement Thickness (max) (m)	Assumptions
Borrow Pits	**14,857**	**14,857**	**0**	**0.6**	Borrow Pit area and associated earthworks will be dressed off with up to 0.6 m of peat and peaty soils as the in-situ peat depths allow. Average peat depths suggest only acrotelmic peat will need to be reused.
Subtotal	**51,474**	**51,474**	**0.00**		
Peat Reuse Peatland Restoration	**10,783**	**4,741**	**6,042**	**This will be in accordance with the restoration activities set out in the oBEMP.**	This will be in accordance with the restoration activities set out in the oBEMP.
Total	**62,257**	**54,451**	**6,0429**		

Table 2 is presented as a summary of the assessment of peat reinstatement volumes. A detailed assessment is provided in Appendix B of this oPMP.

The following assumptions have been made in assessing peat re-use:

Excavated peat will be temporarily placed adjacent to where it is excavated. However, where this is not possible, temporary peat storage areas have been identified. These are areas of previous disturbance area where peat was less than 0.5 m, areas out with 50 m buffer of watercourses and where topography permits. Where peat is used for peatland restoration peat will be moved directly to the restoration area, as opposed to stockpiling the peat before moving the peat to the restoration area.

TABLE 3: PEAT BALANCE CALCULATIONS

Peat Description	Total Peat Demand Estimate for Reinstatement (m³)	Total Peat Supply from Excavation (m³)	Surplus (+) or Deficit (-) (m³)
Acrotelm	51,474	56,481	0

Peat Description	Total Peat Demand Estimate for Reinstatement (m³)	Total Peat Supply from Excavation (m³)	Surplus (+) or Deficit (-) (m³)
Catotelm	0	6,042	0
Total	**51,474**	**62,257**	**10783**

Table 3 demonstrates that while there is a surplus of peat, it will be able to be reused within the Revised Development to reinstate in identified restoration areas from the oBEMP.

3.2.3 WASTE MANAGEMENT PLAN REQUIREMENTS

Based on the calculations carried out, a waste management plan will not be required for the s36 application as all of the peat will be reused within the Revised Development.

4. MITIGATION

4.1 GENERAL MITIGATION

General mitigation measures will be implemented in accordance with the peat and soil excavation, handling and storage, and reinstatement methods detailed in Section 3 of this oPMP and in accordance with best practice guidance listed below.

To minimise the risk of damage to soil structure, the following rules must be observed during all soil handling tasks:

- Reinstatement and restoration will be planned in advance as this generally saves effort at a later stage, ensures opportunities are not lost, and a more successful outcome is achieved. For example, temporary soil and peat storage locations will be identified as close as possible to their final area of reuse to avoid double handling;
- No trafficking of vehicles/plant or materials storage will occur outside demarcated working areas;
- No trafficking of vehicles/plant on reinstated soil (topsoil or subsoil);
- Only direct movement of soil from donor to receptor areas (no triple handling and/or ad hoc storage);
- Soil handling is to be determined based upon soil moisture content. Where practicable soil handling when soil moisture content is above the lower plastic limit (the moisture content at which soil begins to behave as a plastic material and the soil is deemed too wet to handle without causing damage to the soil structure), should be avoided;
- Where soil are wet or damp, to minimise compaction, soils should be handled using excavators rather than dozers;
- No mixing of topsoil with subsoil, or of soil with other materials;
- Soil is only to be stored in designated soil storage areas;
- All soil storage areas (stockpiles) must be planned appropriately and must have clear signage accordingly by the appropriate contractors to ensure no cross contamination occurs and ease of identification for reinstatement;

- Topsoil stockpiles should not exceed 4 m in height and subsoil stockpiles should not exceed 5 m in height. However, if the soil to be stockpiled is dry, formation of higher stockpiles may be permissible, if required, as the soil is likely to remain dry in the core of the stockpile for the entire storage period. However, the appropriateness of higher stockpiles will need to be established on a location by location basis;
- Loose peat that is not overly wet can be stored in stockpiles up to a maximum height of 2m, with turves used to cover them to minimise drying;
- Loose peat that is very wet (i.e. catotelmic peat that has little or no structure) would be relocated directly to its final reuse location without any temporary storage where possible. Where it is not possible to immediately reuse very wet peat it would be stored in purpose-built, bunded locations no deeper than 1m. Any bunded storage area would need to be designed with a sedimentation/settling pond to de-water wet peat and aid sediment containment. Each settling pond must be designed with appropriate filtration treatment facilities prior to connection into the construction-phase surface water drainage;
- Upon the placement of soils into stockpiles has been completed, rainfall and soil moisture conditions are of lesser importance, providing they do not lead to erosion resulting in a loss of the soil resource and potentially a change in soil composition if fine material is lost leaving a greater proportion of stones. Stockpile erosion can also result in significant environmental impacts, such as discharges of sediment laden for pathways that could be susceptible to local receptors (roads, drainage systems and surrounding land);
- Temporary soil and peat stockpiles will avoid sensitive habitats, areas of existing peat erosion and locations with moderate or high risk of peat slide (see Fig 10.2.5 Temporary Peat Storage Areas in Appendix A);
- Temporary soil and peat stockpiles will be located greater than 50m from watercourses. Measures to manage and treat run-off prior to getting into watercourses and minimise the potential for soil erosion during the works will also be set in place through a series of site specific drainage control measures as set out in Technical Appendix A11.2 Water Construction Environmental Management Plan.
- Peat turves will be transferred intact to their temporary storage location where they will be stored, with vegetation upright, in a single layer covering acrotelmic peat stockpiles to minimise the peat drying out. Where required geotextile material can be used to protect underlying vegetation. Peat turves may be stored in double layers (separated by geotextile) provided that such storage does not extend beyond two months;
- The number and locations of temporary peat storage areas will be chosen to minimise the distance that stripped and excavated peat will have to be transported;
- Peat and carbon rich soils will be excavated and reinstated as quickly as possible in a progressive manner to protect these resources as far as possible and therefore minimise the area required for temporary storage at any one time;
- At this stage, temporary storage sites have not been identified. The final locations and footprints of each stockpile will be determined by the Site Engineer and ECoW. Once confirmed, stockpile locations will be accurately recorded on a plan of appropriate scale by the Contractor(s). Marker posts will need to be provided in locations which have been surveyed and recorded (this should also occur if further soil surveys are required);

- Plant and machinery only work when ground or soil surface conditions enable their maximum operating efficiency (i.e. when machinery is not at risk of being bogged down or skidding causing compaction or smearing);
- All plant and machinery must always be maintained in good working condition to ensure that the soil is stripped correctly, for example to ensure that the depth of the strip can be accurately controlled, and to minimise the risk of contamination through spillages;
- The size of the earthmoving plant to be used should be tailored to the size of the area to be stripped and the space available within the working area. For example, the use of a long reach excavator will minimise the need for movement across the soil surface and/or the use of low ground pressure wide tracked vehicles, will further reduce soil compaction; and
- If any soil or aggregate materials are imported as part of the construction, the materials should be subject to sampling and analysis to ensure it is suitable for its intended use from an environmental risk and waste management perspective. This process should be fully documented.
- The deeper areas of peat are generally located on flatter areas on hilltops, separated by valleys and rivers. No assessment has been done to determine whether these areas of peat are hydrologically connected, but the geomorphological map included in **AEI Figure 10.1.2**. of **Appendix 10.1 Peat Slide Risk Assessment of this AEI Report** provides insights into the peat deposits, the watercourses on Site and other geomorphological information on Site. There are areas of Blanket Bog identified on the Site which do not currently have infrastructure located on these areas. The Site infrastructure has been designed in order to avoid these high risk areas.
- The Site Construction Manager, with advice as necessary from the ECoW and/or Site Engineer, will determine whether special mitigation measures are required, such as orientation of the stockpile, levelling/ benching to level the surface, bunding to contain stored materials and/ or site-specific drainage to ensure that runoff waters are sufficiently controlled;
- Peat turves and stockpiles will be regularly managed and inspected throughout their lifetime to ensure maintenance of stockpile stability and integrity. Depending on the length of storage and weather conditions, regular watering may be required to protect the peat from drying out;
- Temporary drainage of peat stockpiles will be inspected regularly to ensure that it is fit for purpose, that runoff from stockpiles is being appropriately managed and mitigated and that it is not draining directly into any watercourse; and
- Should any problems be observed during regular visual inspections of peat stockpiles, this would invoke implementation of an appropriate corrective action which would be recorded and monitored for effectiveness.

4.1.1 HANDLING AND STORAGE OF PEAT

It will be necessary for the contractor to prescribe methods and timing involved in the excavation, handling and storage of peat for use in reinstatement. The contractor will be responsible for appointing a geotechnical engineer who will monitor any potential stability risks. Construction methods will be based on the following principles:

- The surface layer of peat (acrotelm) and vegetation will be stripped separately from the catotelmic peat. This will typically be an excavation depth of up to 0.5 m;

- Acrotelmic material will be stored separately from catotelmic material;
- Careful handling is essential to retain any existing structure and integrity of the excavated materials and thereby maximise the potential for excavated material to be re-used;
- Less humified catotelmic peat which maintains its structure upon excavation should be kept separate from any highly humified amorphous or wet catotelmic peat;
- Acrotelmic material will be replaced as intact as possible once construction progresses/as it is complete;
- To minimise handling and transportation of peat, acrotelmic and catotelmic will be replaced, as far as is reasonably practicable, in the locality from which it was removed. Acrotelmic material is to be placed on the surface of reinstatement areas;
- Temporary storage of peat will be minimised, with restoration occurring in parallel with other works;
- Suitable storage areas should be sited in locations with lower ecological value, low stability risk and at a suitable distance from water courses;
- Peat should be stored in stockpiles no greater than 2 m in height;
- Reinstatement will, in all instances, be undertaken at the earliest opportunity to minimise storage of turves and other materials;
- Managing the construction work as much as possible to avoid periods when peat materials are likely to be wetter i.e. high rainfall events;
- Temporary storage and replacement of any peat excavated from the borrow pit should occur adjacent to and within the source pit; and
- Transport of peat on Site from excavation to temporary storage and restoration site should be minimised.

4.2 SPECIFIC MITIGATION

Along with the general mitigation measures presented in section 4.1 and principles outlined in Section 3.2 on this oPMP, additional mitigation measures will be implemented in specific areas of the Site where the potential impact on peat is considered to be the greatest. These additional measures are outlined in Table 4.

TABLE 4: SPECIFIC MITIGATION MEASURES

Location	Details of Peat	Proposed Mitigation
Track between T3 and T4.	Deep peat up to 5 m.	Floating track will be used in this area to minimise the impacts on peat. The proposed area of floating tracks can be seen in **AEI Figure 10.2.4** in **Appendix A.**

Location	Details of Peat	Proposed Mitigation
Borrow Pits	Acrotelmic Peat	Acrotelmic peat excavated from the Site during construction will be used to 'sensitively reprofile' the borrow pits to tie in with the surrounding landform as far as reasonably practicable, with turves reused to allow natural regeneration wherever possible. However, where insufficient turves are available, or there is a risk of erosion then reseeding with a suitable upland seed mix to match surrounding habitats will be undertaken.

5. CONCLUSION

The following conclusions are drawn regarding the management of peat and excavated materials within the site:

- As a result of the peat excavation and re-use estimates, it is estimated that all of the peat will be able to be reused on Site to dress track and compound embankments, reinstate the borrow pits and in restoration areas identified within the oBEMP.
- The estimates of excavated peat provided in this report are likely to be higher than those that occur during construction, as micro-siting and the use of floating tracks will allow for the avoidance of localised pockets of deeper peat;
- Sufficient methods have been defined to ensure that peat can be sensitively handled and stored on Site to allow for effective re-use; and
- No waste licence is required for the construction work relating to peat management as it can successfully be reused within the Site.

APPENDIX A FIGURES

APPENDIX CONTENTS LIST

APPENDIX B EXCAVATION AND RE-USE VOLUMES AND CALCULATIONS

ERM HAS OVER 160 OFFICES ACROSS THE FOLLOWING COUNTRIES AND TERRITORIES WORLDWIDE

Argentina
Australia
Belgium
Brazil
Canada
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
The Netherlands
New Zealand
Peru
Poland
Portugal
Romania
Senegal
Singapore
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APPENDIX 16.1 LIGHTING STRATEGY

WIND BUSINESS SUPPORT

Version 1
27/08/2024
Author: Ian Fletcher

CLOUD HILL WIND FARM

AVIATION LIGHTING

DESIGN AND CONSULTATION

COMMERCIAL-IN-CONFIDENCE

Tel 07971 780936
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INTRODUCTION

A wind farm is proposed in Dumfries and Galloway, 5km South-West of Sanquhar; details below. The proposed development was the subject of a planning application , ECU reference ECU00003461, submitted in October 2023.

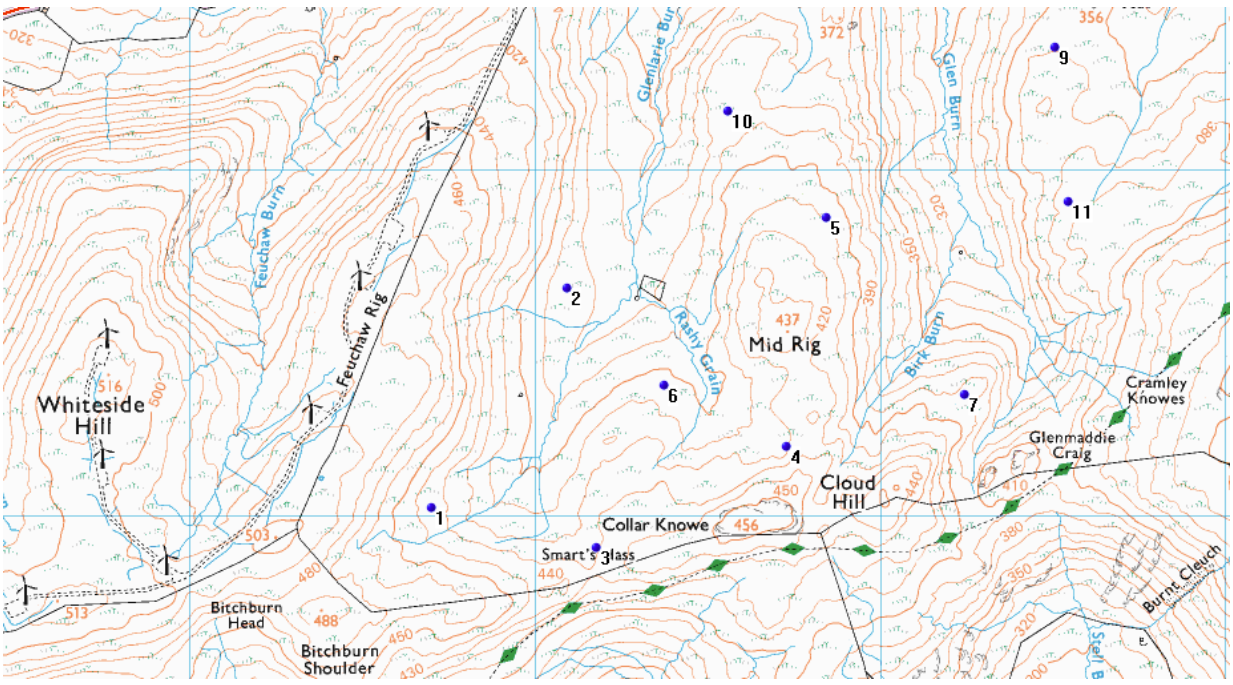
An important aspect of the design is the turbine aviation obstruction lighting; both in terms of air safety and of visual impacts. The purpose of this document is to provide information on the Proposed Development and of the proposed turbine aviation lighting scheme, in order to receive feedback from key aviation stakeholders and airspace users. The feedback will be used to inform the lighting design as needed.

This document is to be distributed to those aviation stakeholders identified under the consultations section at the end of the document. Having collected the views of these stakeholders and reviewed the lighting design, a final scheme will then be lodged with the UK Civil Aviation Authority (CAA) for their approval. The report to the UK CAA will include all the feedback provided through this consultation process.

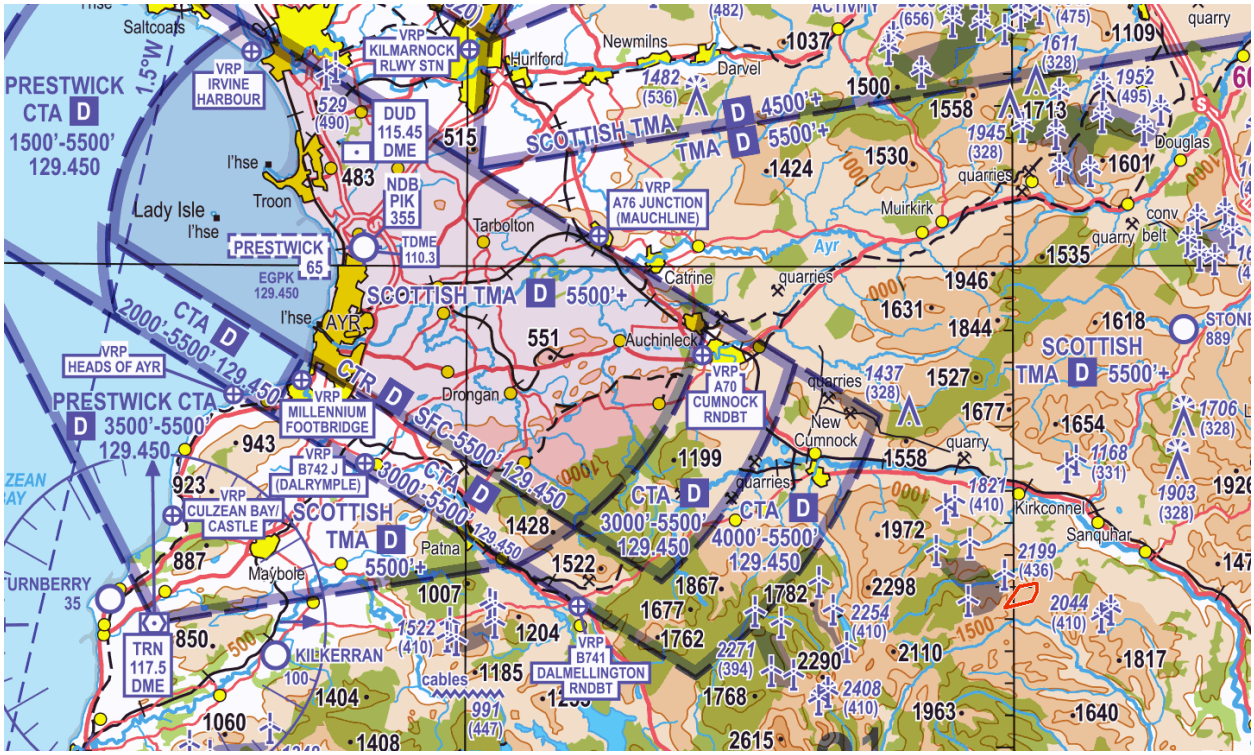
THE PROPOSED WIND FARM

The application is for a development comprising 10 turbines, with a tip height of 180m. note that there is no turbine 8.

No.	Easting	Northing	NGR	Base Elevation m	Tip Height m	Tip Elevation m AOD
1	272702	605026	NS 72702 05026	436	616.0	2021.1
2	273094	605660	NS 73094 05660	383.72	563.7	1849.6
3	273179	604912	NS 73179 04912	429.5	609.5	1999.8
4	273731	605202	NS 73731 05202	418.87	598.9	1964.9
5	273847	605863	NS 73847 05863	408.95	589.0	1932.3
6	273377	605381	NS 73377 05381	402.29	582.3	1910.5
7	274247	605353	NS 74247 05353	390.88	570.9	1873.1
9	274508	606358	NS 74508 06358	358	538.0	1765.2
10	273562	606171	NS 73562 06171	384.94	564.9	1853.6
11	274545	605910	NS 74545 05910	374.36	554.4	1818.9



Turbine location OS 1:25,000; © Crown copyright. All rights reserved. License number 100040585



Site location on CAA Aviation chart; shown as a red outline at the south-east corner of the map

LEGISLATION AND GUIDANCE

LEGISLATION

The treatment of land-based obstacles to air navigation is covered by existing legislation. Obstacles located close to licensed aerodromes are covered under Section 47 of the Civil Aviation Act 1982. Article 222 of the Air Navigation Order (ANO) 2016 details the requirement for the lighting of land-based tall structures located outside of the safeguarded areas of licensed and government aerodromes.

Onshore Obstacle Lighting Requirement ICAO regulations (Annex 14 Chapter 6) and article 222 of the ANO 2016 require that structures away from the immediate vicinity of an aerodrome, which have a height of 150 m (492 ft) or more AGL are:

1. Fitted with medium intensity steady red lights* positioned as close as possible to the top of the obstacle, and also equally spaced at intermediate levels, so far as practicable, between the top lights and ground level with an interval not exceeding 52 m;

2. Illuminated at night, visible in all directions and any lighting failure is rectified as soon as is reasonably practicable;

* 'Medium intensity steady red light' means a light that complies with the characteristics described for a medium intensity type C light as specified in Volume 1 (Aerodrome Design and Operations) of Annex 14 (Third edition November 1999) to the Chicago Convention.

POLICY

The CAA issued a Policy Statement in June 2017 called "Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level".

This policy statement highlights and clarifies the requirements set out in the ANO, for the lighting of onshore turbines.

Lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on whenever illuminance reaching a vertical surface falls below 500

LUX. The control device should turn the lights off when the illuminance rises to a level of 500 LUX or more.

If the horizontal meteorological visibility in all directions from every wind turbine generator in a group is more than 5 km, the intensity for the light positioned as close as practicable to the top of the fixed structure required to be fitted to any generator in the windfarm and displayed may be reduced to not less than 10% of the minimum peak intensity specified for a light of this type.

In practice, the CAA considers every proposed development on a case by case basis, taking into account the specific environment, including the existing developments and lighting as well as the benefits of reduced lighting schemes where light pollution is an issue. Where supported by appropriate studies and consultations, the CAA may agree to a variation to the lighting requirements specified in the ANO, under provisions given in the ANO Article 222 section 6.

GUIDANCE
In respect of an Aircraft Detection Lighting System, the Department for Transport published guidance on 26 October 2021 stating that "the Department for Transport and the Civil Aviation Authority will convene a task force…to develop and publish electronic conspicuity (EC) specifications to enable interoperability between airspace users. The adoption of EC specifications will not be mandated UK-wide. However, compliance with the established EC specifications will be required in mandatory airspace to ensure interoperability between airspace users." While you note that the most promising direction for ADLS is a system that exploits electronic conspicuity as a means to trigger obstacle lighting, we are aware of certain developers who are keen to use ADLS with active detection from the ground as well as the need to better understand aviation operations and equipage levels at night in the airspace over the Scottish mainland. We will consider what additional activity is required for this and keep the wind industry advised accordingly.

https://www.gov.uk/government/publications/electronic-conspicuity-specifications/electronic-conspicuity-specifications-enabling-interoperability-between-airspace-users

The CAA released a Civil Aviation Publication (CAP) 764 Wind Turbine Policy Consultation document for comment in March 2024. At this stage, the findings will not be incorporated into the proposed aviation lighting strategy given the policy has not yet been formally adopted.

The main changes to the policy will be the incorporation of general aviation obstacle lighting requirements for onshore and offshore wind turbines. The new onshore wind turbine lighting and marking chapter will include the extant CAA Policy Statement on the 'Lighting of Wind Turbine Generators above 150m in United Kingdom Territorial Waters' (June 2017) and will also adopt ICAO Annex 14 recommended practices on the lighting of wind farm perimeter lighting. In addition, it is expected to introduce requirements for ADLS.

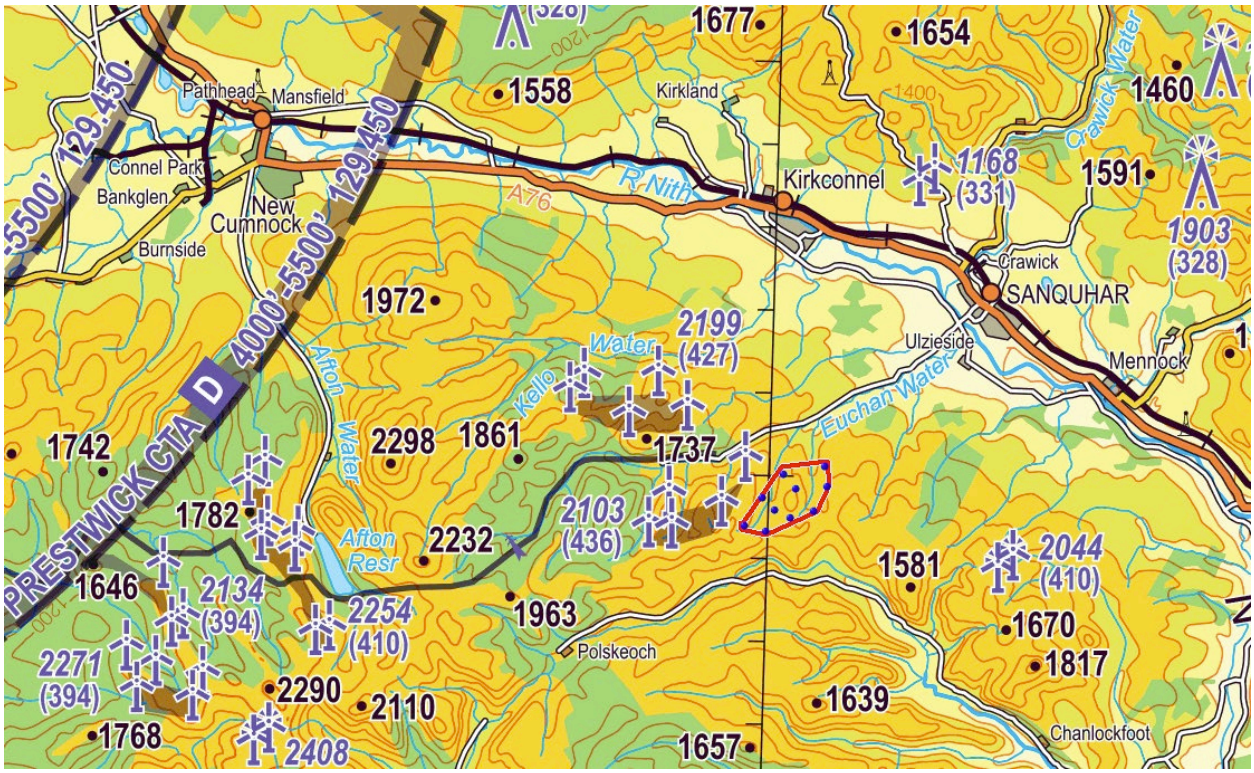
DESIGN CONSIDERATIONS

AIRSPACE ENVIRONMENT

The site lies directly underneath class G uncontrolled airspace, but within the Scottish Terminal Area with controlled airspace from 5,500ft. It is approximately 42km south-east of Prestwick Airport and over 60km from both Glasgow and Edinburgh Airports.

It is also within the Tactical Training Area, TTA 20T, used for military low flying training. However, the area is already characterised by wind turbines and lies adjacent to the operational Whiteside Hill wind farm, comprising 11 turbines of height 121.2m.

In addition to military traffic using the Tactical Training Area, there is likely to be some low level GA traffic in the area occasionally and police, ambulance and Search and Rescue helicopters will also occasionally operate in the area.



Local area on CAA VFR 1:25,000 chart

The most elevated turbine tip (T1) is at 2021ft. This is a similar elevation to the adjacent wind farms.

LIGHTING ENVIRONMENT

The immediate group of turbines that this development will form a part of, is unlit, with no other lit obstacles in the immediate proximity. The nearest conurbation is Sanquhar, approximately 5km north-east of the nearest turbine.

The Twenty Shilling wind farm, 4km east, is lit. This wind farm comprises 9 turbines of tip height 140m. The lighting is believed to be low intensity 25 candela visible spectrum lighting, mounted on the nacelle only, to meet the requirements of the MOD.

LIGHT POLLUTION / DARK SKIES

With the nearest conurbation approximately 5km away and no other lit obstacles in the immediate area, the background light levels will be very low.

Dumfries and Galloway Council has raised concerns about light pollution from the proposed aviation lighting. There is therefore a pressure on the developer to seek to reduce the aviation lighting.

LIGHTING REQUIREMENT

The turbines proposed have ground to tip heights of 180m. Because they are over 150m tall, there is a statutory requirement for en-route aeronautical obstacle lighting, under the ANO Article 222.

Under provisions given in the ANO Article 222 section 6, the CAA can agree to a variation to the lighting in recognition of the benefits of reduced lighting schemes where light pollution is an issue; where supported by appropriate studies and consultations.

THE PROPOSED LIGHTING SCHEME

There is a statutory requirement to light the wind farm because the turbines are over 150m tall.

Current Lighting Scheme
The planning submission specified medium intensity lighting (2,000 cd) located on the nacelles of all turbines. In addition three low intensity lights to be provided at an intermediate level of half the hub height on all turbines. These would need to be fitted around the towers to allow for 360degrees horizontal visibility. The 2,000 cd medium intensity lights may be dimmed to 10 %, or 200 cd, if visibility is greater than 5 km.

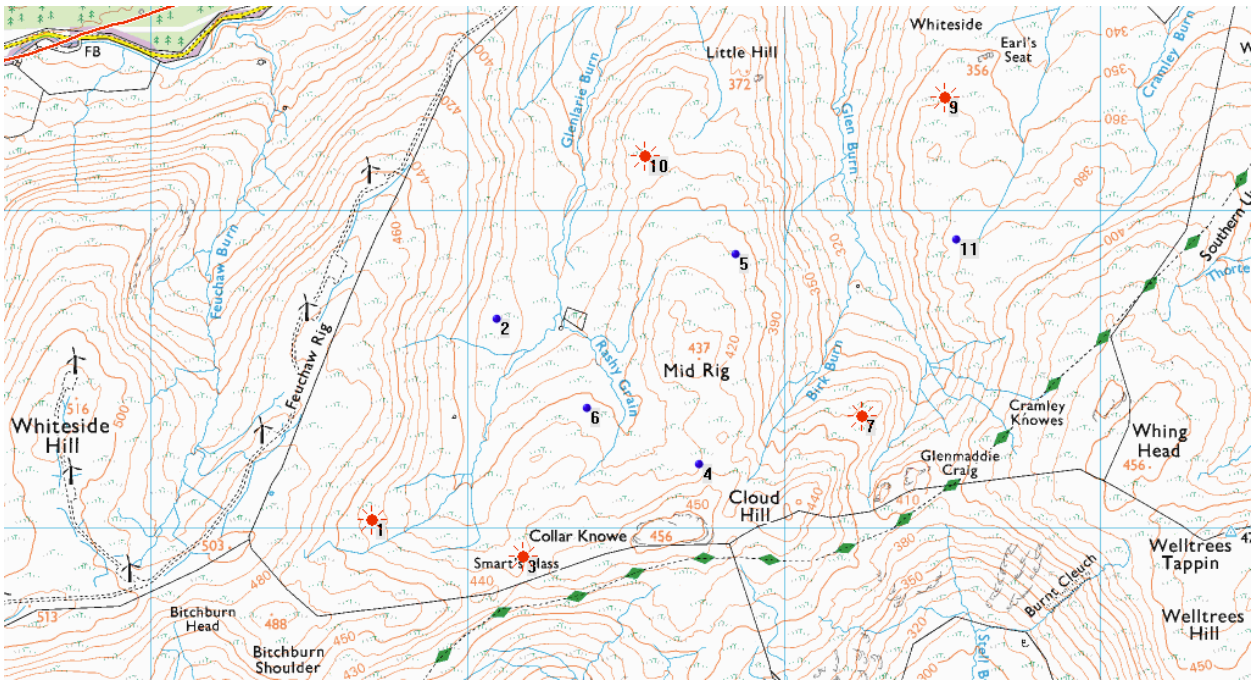
Proposed Lighting Scheme
It is proposed to reduce the degree of lighting in order to reduce the night-time visual impacts in recognition of the concerns of the Council.

Because of the nature of the area, light pollution from aviation obstacle lighting is of concern. In balancing the two requirements of aviation safety and light pollution, it is considered appropriate to use a reduced lighting scheme, with not all turbines being lit. This can be acceptable where the night time use of the airspace is rarely low flying VFR (Visual Flight Rules) traffic, without the use of NVDs (Night Vision Devices).

In consideration of the combination of the legislation and the local design considerations, it is proposed to use a cardinal lighting scheme. This requires visible spectrum obstacle lights on the turbines that define the geographical footprint of the wind farm.

In this case, the proposal is for 5 turbines to have nacelle mounted, medium intensity, visible spectrum, steady red obstacle lights, specifically turbines 1, 3, 7, 9 and 10; illustrated on the map below. The lights to operate from dusk until dawn.

This will include the most elevated turbine, ie the turbine having the most elevated turbine tip, T1.



Proposed Lit Turbines – 1,3,7,9,10

EXPLANATORY NOTES

The lit turbines will define the principle corners and the wind farm geographical foot-print. The lit turbines have been selected to provide fairly regular spacing between lit turbines, which can improve pilot acquisition of the nature and extent of the development.

- Turbine 1 has the most elevated tip and hence should be lit.
- Turbines 1, 3, 7, 9 and 10 define the principle corners.
- The remaining turbines are close to being within the shape defined by the corner turbines identified above. See note 1
- There are no internal, unlit turbines which are exceptionally elevated relative to lit turbines in their immediate proximity. See note 2

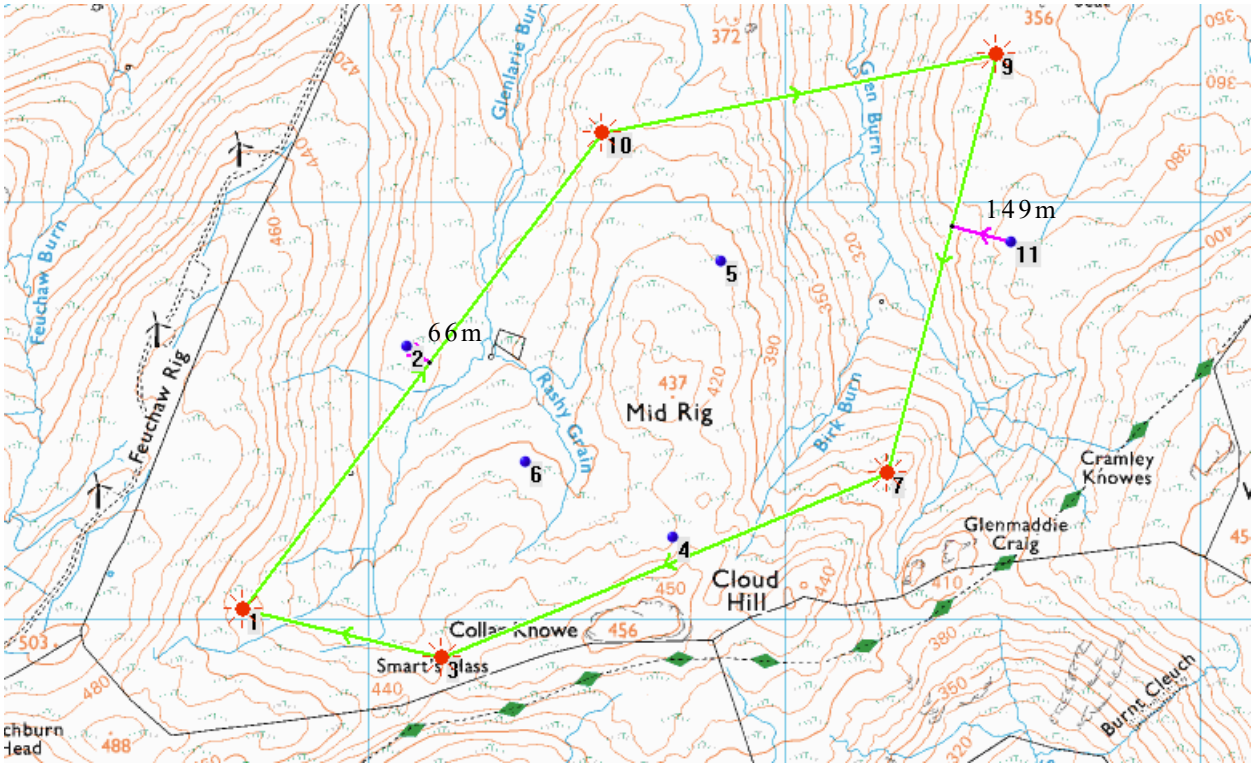
Turbines listed in decreasing tip elevation order

T_NO	Base elevation m	Blade Tip Height m	Tip Elevation m	Tip Elevation ft
1	436	180	616.000	2021.1
2	429.5	180	609.5	1999.8
3	418.87	180	598.9	1964.9
4	408.95	180	589.0	1932.3
5	402.29	180	582.3	1910.5
6	390.88	180	570.9	1873.1
7	384.94	180	564.9	1853.6
9	383.72	180	563.7	1849.6
10	374.36	180	554.4	1818.9
11	358	180	538.0	1765.2

The turbines with red text are proposed to be lit.

Note 1

Turbines 4, 5 and 6 are entirely within the lit turbines. Turbine 2 is 66m beyond the direct line between lit turbines. Turbine 11 is 149m beyond the direct line between lit turbines. See the diagram below.



Note 2
The unlit T5 is 17.4m (57ft) higher than the adjacent lit T7. This is not exceptionally higher and hence an aircraft practicing reasonable vertical clearance from the lit turbines 7, 9 and 10 will maintain a safe vertical separation from T5.

LIGHTING SPECIFICATION

Visible spectrum obstacle lighting must consist of one medium intensity (2000 candela) steady red light, mounted on the top of the nacelle, and a second alternative 2000 candela red light provided in case of failure of the operating light. No intermediate level lights to be fitted on the turbine towers.

Visible lights can be dimmed to 10% of peak intensity when the visibility as measured at the wind farm exceeds 5km in all directions.

Summary of lighting specification:

- Medium intensity steady red (2000 candela) lights on the nacelles of turbines 1, 3, 7, 9 and 10 (5 in total);
- a second 2000 candela light on the nacelles of the above turbines to act as alternatives in the event of a failure of the main light;
- the lights on these turbines to be capable of being dimmed to 10% of peak intensity when the visibility as measured at the wind farm exceeds 5km;

CONSULTATIONS

The following consultees are considered to be relevant to this location.

Consultee	Reason
Glasgow Prestwick Airport	Aircraft using the airport may vector in this area and the airport provides air traffic services to aircraft in this area.
MOD	Conducting low level operations within TTA 20T
Police Scotland	Use of helicopters, flying low on visual flight rules
Scottish Air Ambulance	Use of helicopters, flying low on visual flight rules

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