Technical Appendix 6.3: Peat Management Plan

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Consulting Report

Technical Appendix 6.3 - Peat Management Plan
Appin Wind Farm

Dumfries and Galloway, Scotland
Statkraft

O-NR-R14-0045-D-002v02

28/04/2025

Client

Appin Wind Farm Limited

CONTENTS

1. INTRODUCTION

1.1. Background

Appin Wind Farm Limited (the Applicant) is seeking consent under Section 36 of the Electricity Act 1989 for construction of the Appin Wind Farm, Dumfries and Galloway (hereafter the 'Proposed Development').

The site for the Proposed Development lies approximately 6.2 km north of Moniaive and 14.8 km east of Carsphairn and is approximately 3.5 km^2 (c. 350 ha) in area (see Figure 3.1 of EIA Report). The site is set within and surrounded by relatively steep sided rolling hills that are largely planted with commercial plantation forestry.

The Proposed Development will comprise:

- Up to nine turbines of up to maximum blade tip height of 200 m.
- Turbine foundations and hardstandings for blade, tower and nacelle storage.
- A network of on-site access tracks of which 14.8 km will be upgraded existing track and approximately 13 km will be new track with turning heads and passing places.
- An on-site substation compound (70 m x 150 m) including a control building for the Scottish Power Energy Networks (SPEN) substation and wind farm substation.
- One SPEN construction compound (50 m x 100 m).
- One temporary construction compound for the Applicant (50 m x 100 m).
- Three borrow pit search areas.

This Peat Management Plan (PMP) follows guidance (Scottish Renewables & SEPA, 2012) on the assessment of peat excavation and reuse for wind farms in Scotland. The PMP was prepared in parallel with a Peat Landslide Hazard and Risk Assessment (PLHRA, **Technical Appendix 6.4**) and is informed by peat depth probing undertaken by Kaya Consulting and documented in Technical **Appendix 6.2**.

1.2. Scope of Work

The scope of the PMP is as follows:

- Summarise the design principles adopted for design of the Proposed Development with respect to peat soils, including the approach to peat characterisation and the identification of opportunities taken to minimise impacts on peatlands within the Site.
- Calculate the potential volumes of peat that may be excavated in association with Proposed Development construction, both acrotelmic and catotelmic peat.
- Identify and justify reuse of acrotelmic and catotelmic peat where it cannot be reinstated at source.
- Identify good practice measures to ensure excavated peat is stored safely and with minimal loss of function prior to its reinstatement.

The PMP follows the advice issued in SEPA's Scoping Opinion response of 14/04/2022.

1.3. Report Structure

This report is structured as follows:

- Section 2 provides an outline of relevant guidance relating to the excavation, storage and reuse of peat.
- Section 3 provides an overview of the Site and Proposed Development infrastructure based on the Proposed Development described in **Chapter 4** and on desk study review of site information.
- Section 4 describes the approach to and results of peat excavation calculations, and summarises opportunities for reuse of excavated peat soils within the Site.
- Section 5 provides general good practice measures and measures specific to the conditions at the proposed Site.

Where relevant information is available elsewhere in the Environmental Impact Assessment (EIA) Report, this is referenced in the text rather than repeated in this report.

2. CONTEXT TO PEAT MANAGEMENT

2.1. Peat as a Carbon Store

Priority peatland habitats comprise blanket bog, lowland raised bog, lowland fens, and part of the upland flushes, fens and swamps, as listed in the UK Biodiversity Action Plan (UK BAP). Blanket bog is the most widespread of these habitat types in Scotland, and therefore it is blanket bog that is usually of relevance for proposed developments/wind farms in upland areas.

Blanket bogs in the UK started forming in the early Holocene, with most UK bogs initiating prior to 6,000 years ago under cooler and wetter conditions than at present. Where bogs remain waterlogged and peat forming plant species persist, blanket bog is still considered to be actively forming and accumulating organic matter, and therefore can be considered a carbon sink. A bog that is not losing carbon/peat but is no longer accumulating organic matter can be considered a carbon store, and a degrading bog can be considered a carbon source (Mills et al, 2021).

A peatland may change state between sink, store and source through natural processes or as a result of human activity. The purpose of the PMP is to avoid impacts on the peat carbon stores at the Proposed Development Site by avoiding peat, where possible, or by minimising impacts where peat cannot be avoided. Where there are opportunities to improve peat condition, e.g. through restoration, and in so doing, help convert carbon sources into stores or sinks, this may also be facilitated by the PMP (in conjunction with the Nature Enhancement Management Plan [NEMP], refer to **Technical Appendix 7.5**).

2.2. Good Practice Guidance

Where peat is to be excavated in association with built infrastructure, it may be considered to be a waste product under the following legislation:

- Environmental Protection Act 1990 (as amended).
- Landfill (Scotland) Regulations 2003 (as amended).
- The Waste Management Licensing (Scotland) Regulations 2011.

In order to address this legislation, a number of guidance documents have been issued to assist applicants in responsibly planning, installing and operating infrastructure in peatland settings. This PMP has been informed by this collective good practice, which includes the following documents:

- Good Practice during Wind Farm Construction, Version 4 (Scottish Renewables, Scottish Natural Heritage, Scottish Environmental Protection Agency, Forestry Commission Scotland, 2024).
- Developments on Peat and Off-Site Uses of Waste Peat, WST-G-052 (SEPA, 2017).
- Peatland Survey. Guidance on Developments on Peatland (Scottish Government, Scottish Natural Heritage and SEPA, 2017a).
- Peat Landslide Hazard and Risk Assessments, Best Practice Guide for Proposed Electricity Generation Developments (Second Edition) (Scottish Government, 2017).
- Carbon and Peatland 2016 Map (GIS) (Scottish Natural Heritage, 2016a).
- Carbon-rich Soils, Deep Peat and Priority Peatland Habitat Mapping, Consultation Analysis Report (Scottish Natural Heritage, 2016b).
- Scotland's National Peatland Plan - Working for our future (Scottish Natural Heritage, 2015a).

- Constructed Tracks in the Scottish Uplands, 2nd Edition (Scottish Natural Heritage, 2015b).
- Developments on Peatland: Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (Scottish Renewables and SEPA, 2012).
- Floating Roads on Peat - A Report into Good Practice in Design, Construction and Use of Floating Roads on Peat with particular reference to Wind Farm Developments in Scotland (Scottish Natural Heritage and Forestry Commission Scotland, 2010).

In general terms, the guidance considers appropriate activities to be undertaken at the planning (Environmental Impact Assessment), post-consent/pre-construction and construction stages. The overarching principles are generally the same across the different guidance documents and are set out below.

During planning (EIA):

i. Determine at a sufficient level of detail the distribution of peat within a site in order to assess the likely level of impact of proposed works.

ii. Calculate the volumes of peat likely to be excavated during construction.

iii. Demonstrate how excavated peat will be managed (ii and iii together comprising an assessment of the "peat and soil balance").

These activities are normally considered within a PMP, delivered as part of the EIA at the planning stage.

Given consent, during the pre-construction period:

i. A refined peat and soil mass balance should be calculated through further site investigation works (including intrusive works such as detailed probing across final infrastructure footprints and/or trial pits to verify the nature of probed materials), noting the requirements within the Standard Conditions with regard to peat impacts.

ii. Further detailed topographic survey and design level excavation, storage and reuse plans should be drafted to enable contractors to bid for and implement the works.

iii. Key good practice measures should be identified within the PMP that integrate with other related plans or control documents for construction, including, where applicable, the Outline Construction Environmental Management Plan (OCEMP), Site Waste Management Plan, Nature Enhancement Management Plan (where relevant) and Geotechnical Risk Register.

During the construction stage:

i. Utilise micro-siting to optimise infrastructure locations relative to final pre-construction information gathered on site.

ii. Monitor, adjust and implement the PMP to accommodate deviations in expected peat volumes and adapt reuse measures to actual site volumes.

iii. Set-up monitoring programmes to identify the new post-construction baseline and provide a basis for monitoring the success of the PMP and identify appropriate mitigation where necessary.

Through the different stages of the Proposed Development, the strategy should be to prevent disturbance to and losses of peat through appropriate reuse, wherever possible.

2.3. Approach at the Proposed Development

The strategy for peat management for the Proposed Development follows SEPA's guidance for developments on peat and uses of waste peat (SEPA, 2017) and aligns with National Planning Framework 4, Soils, Policy 5 in employing the mitigation hierarchy with respect to carbon-rich soils and peatlands. The hierarchy is as follows:

- **Prevent** the creation of waste peat by minimising overlap of infrastructure with peat, where it is possible to do so, and given other site and design constraints that may influence turbine locations and associated infrastructure (such as tracks).
- **Reuse** peat on site in construction, reinstatement or in restoration (restoring off-site will require environmental authorisation).
- **Recycle** as a soil substitute or for use in other works (where on-site or off-site use in restoration is not possible).

Disposal of peat (i.e. export from the site as waste) is no longer considered an acceptable outcome for materials generated during construction.

At the Proposed Development, a combination of prevention and reuse has formed the peat management strategy. Outline details of this strategy are provided below, and full detail of excavation and reuse proposals are provided in Section 4.

2.3.1. Prevent

Prevention involves minimising the amount of peat excavated during construction by informed layout planning. The extent to which this is possible is not just a function of the amount of peat on site, but also of the presence of other constraints (e.g. landscape visual impacts, hydrology, terrestrial ecology) and the practical requirements of wind farm construction (e.g. minimum turbine spacings, acceptable gradients for tracks / hardstandings).

At the Proposed Development Site, peat is relatively limited in extent, and therefore efforts have been made to minimise overlap as far as possible. This has resulted in:

- 8 of 9 turbines having average probed depths of <0.5m over their foundation and hardstanding areas (i.e. in carbon-rich soil, rather than peat).
- 7 of 9 turbines avoid peat >1.0 m entirely with only small areas of ancillary infrastructure on peat >1.0 m.

As a result, the proposed layout has minimised peat excavation insofar as is possible over most of its footprint.

2.3.2. Reuse

The primary reuse strategy for peat management is to use peat to reinstate temporary construction locations and reinstate peat around infrastructure on the summits, where it is most likely to remain wet, retain its carbon and support peatland habitats. Reinstatement approaches are derived from the Good Practice guidance detailed in Section 2.1 and from wider good practice approaches developed as part of wind farm construction over the last few years.

This is considered in further detail in Section 4.

2.3.3. Disposal

No disposal of peat is required in association with the Proposed Development.

3. BASELINE CONDITIONS

3.1. Site Overview

The Proposed Development is distributed around the summit slopes of a horseshoe-shaped east-facing valley drained by the Appin Burn. The highest point is Colt Hill (598 m AOD) at the western limit of the main infrastructure area. On the northern valley side, an access track sits just south of the catchment divide to Shinnel Water in the next valley, and Turbine 1 is located just short of Lamgarroch (573 m AOD). Turbine 2 sits between Turbine 1 and Colt Hill, with the track broadly following the contour around to the southern valley side. Turbine 3 sits just north of Blackcraig Hill (555 m AOD) while Turbines 5 and 6 are located on twin peaks at Mullwhanny (535 m and 520 m AOD), with Turbine 4 in the saddle between Blackcraig and Mullwhanny's western slopes. Turbines 7 and 8 are on the north side of Transparra / Wether Hill and Turbine 9 just north of Green Hill (540 m AOD). There is a sharp drop in elevation to the valley floor of 250-300 m (Figure 6.3.1). Key geographical features are shown on the perspective view on Plate 3.1.

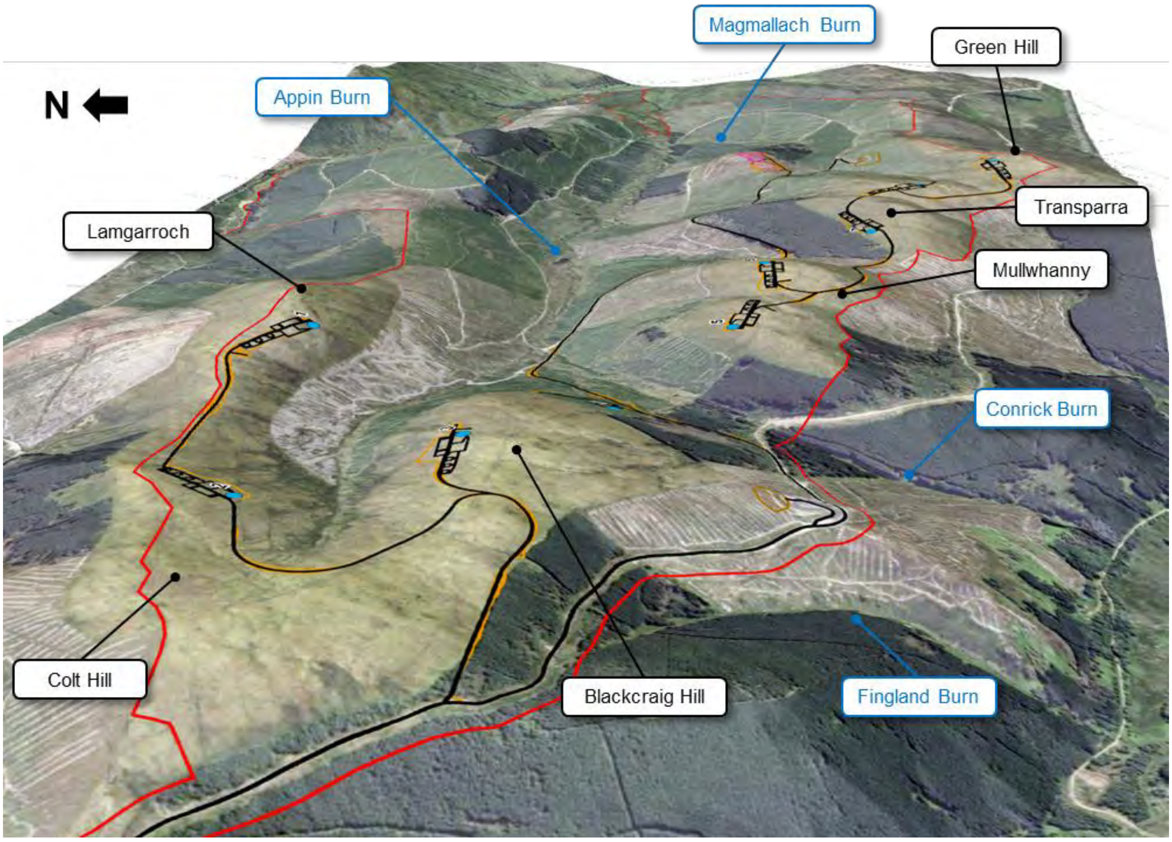

Plate 3.1 Perspective view of site showing key geographical features

Figure 6.3.2 shows slope angles to be steep over much of the site, with the majority of sideslopes exceeding 15° and relatively large areas >25°, particularly on south facing slopes on the north side of the valley.

Generally, slope shapes are convex from the summits and ridgelines over onto the sideslopes and then rectilinear down to the valley floor. Because of this, the availability of gently sloping or neutral ground surfaces for peat reuse is very limited and floating track has not been specified as a mitigation design for the Proposed Development.

3.2. Peat Depth and Character

Peat depth probing was undertaken in several phases in accordance with Scottish Government (2017) guidance:

- Phase 1 probing on a 100 m grid was undertaken from September to October 2021 and in November 2022 – in total, 740 probes were taken in Phase 1.
- Phase 2 probing was undertaken in December 2024 and February 2025 on a 10 m grid within infrastructure footprints and at 50 m intervals with 10 m offsets along access tracks – in total, a further 3,509 probes were taken in Phase 2 taking the total number to 4,249.
- Cores were acquired at all turbine locations, construction compounds, the substation and borrow pits.

A Peat Survey Report (Appendix 6.2) documents the findings of these site investigations and summarises peat depth variation over the Site. Peat depth data was used to generate a peat depth model. Interpolation of peat depths was undertaken in the ArcMap GIS environment using a natural neighbour approach. This approach was selected because it preserves recorded depths at each probe location, unlike some other approaches (e.g. kriging), is computationally simple, and minimises 'bullseye' effects. The approach was selected after comparison of outputs with three other methods (inverse distance weighted, kriging and TIN).

Taken together the peat depth probing and model indicate the following:

- Peat is generally shallow or absent across much of the Proposed Development area, 86.8% of probes returning depths of <0.5 m, 10.7% of probes depths of 0.5 – 1.0 m and only 2.5% of probes >1.0 m.
- Peat is almost entirely absent from the sideslopes and valley floor, with the majority of deposits present at altitude on the gently sloping summits and moderate sideslopes above the forest – these locations are also the most practicable for wind infrastructure (from both a resource and constructability perspective).
- The deepest deposits lie in the saddle between Blackcraig Hill and Mullwhanny and are centred on the unnamed watercourse that flows north to Appin Burn; here, peat depths reach between 2.0 and 3.0 m. These areas have been avoided.
- Pockets of peat of up to 2.0 m are present elsewhere (with one isolated point at 4.0 m, away from infrastructure and outside the main infrastructure area), but are largely avoided by infrastructure.
- No amorphous peat was recorded at the Site.

The peat depth model is shown on Figure 6.3.3 with probing locations superimposed. The average depths of peat within the permanent hardstanding footprints for Turbines 1 to 9 are shown in Table 3.1. Mean depths are below 0.5 m within the hardstanding and foundation areas for all but one turbine (Turbine 8), though locally peat depths exceed 1.0 m at Turbines 8 and 9.

Overlap with peat >1.0 m occurs in five locations:

- At the tip of the turning head east of Turbine 3.
- In earthworks on the approach to Turbine 8 and in the corner of the main hardstanding area.
- At the tip of the turning head east of Turbine 9.

- Adjacent to the substation compound.

Comparison of the peat depth model with the layout indicates that significant efforts have been made during layout design to site infrastructure out of the deepest peat areas and to route access tracks onto shallower peat.

Infrastructure	Mean Depth (m)	Max Depth (m)
Turbine 1	0.28	0.63
Turbine 2	0.36	0.64
Turbine 3	0.45	0.87
Turbine 4	0.27	0.64
Turbine 5	0.35	0.71
Turbine 6	0.31	0.55
Turbine 7	0.26	0.43
Turbine 8	0.50	1.73
Turbine 9	0.47	1.08

Table 3.1 Average soil and peat depths within hardstanding area (including clearance, excluding earthworks)

The Carbon and Peatland (2016) Map shows Class 1 carbon-rich soils, deep peat and priority peatland habitat around much of the head of the valley, however, peat depth data and habitat data do not support this classification, nor does it support the extent of Class 2 peatland on Mullwhanny on the south side of the valley.

3.3. Peat Geomorphology and Condition

Plates 3.2 and 3.3 show typical features and ground conditions at the Site, which is relatively featureless over the majority of the infrastructure footprint, comprising open summits with very little evidence of erosion or gullying. Where erosion is present, it is usually in association with drain floors that have started to cut into the underlying substrate due to steepening slopes (e.g. Plate 3.2b). Elsewhere, the most frequent features are diffuse drainage zones, or flushes, within which rushes tend to dominate and surface water flow is more noticeable. There are isolated pipes present on the northern valley side, though not in proximity to infrastructure. Isolated bog pools are present on the southeast side of Transparra and on Communnoch Hill in the southeast of the Site.

The site has been relatively widely drained, both on the upper slopes above the forestry and within the planted areas (see Figure 6.3.4). In total over 32 km have been cut into the slopes within the main infrastructure area. While the drains are likely to be active, they are generally of insufficient size to accommodate peat and would be best restored using conventional techniques.

In relation to peat reuse and restoration:

- There are no bare or eroding areas (gullies or open ground) within which peat could be reused for patch repair.
- There are no peat cuttings in which peat could be reused to reinstate the former ground surface.
- Afforested areas are generally outside peat and on steep slopes and are therefore not suitable for restoration with reused peat, with the exception of the temporary construction areas adjacent to the proposed substation.

- While there are drains, these are not suitable for peat reuse in restoration.

Plate 3.2 Typical hydrological features: a) an active artificial drain on the northern valley side, b) the eroding floor of a widening active drain, c) the Appin Burn in its upper reaches, d) the Appin Burn in the wider valley floor

Further information on the geomorphology of the Site is provided within the PLHRA (Technical Appendix 6.4) based on geomorphological mapping from satellite imagery and subsequent field walkover and verification.

Plate 3.3 Typical terrain features: a) Better quality habitat within forest rides east of Turbine 1 (and away from infrastructure), b) typical exposed and featureless planar summit, c) dense forest on moderate sideslopes, d) flush zone with flattened grasses amongst rushes on moderate slope

4. PEAT EXCAVATION AND STORAGE

4.1. Excavation calculations

The majority of infrastructure comprising the Proposed Development will require full excavation of the peat or soils underlying the infrastructure footprints during construction (**Chapter 4**). However, some infrastructure is not required post-construction (the construction compound, blade laydowns, ancillary crane pads and clearance areas) and the soils and peat excavated from these areas will be directly reinstated.

In this section, the following terms are used to describe groundworks associated with peat / soil and Proposed Development infrastructure:

- **Permanently excavated:** peat will be permanently removed from the infrastructure footprint, stored locally and reused elsewhere.
- **Temporarily excavated:** peat will be temporarily removed from the infrastructure footprint, stored locally and fully reinstated at the point of excavation post-construction.
- **Landscaping:** the process of using peat to 'dress' the boundaries of infrastructure.
- **Restoration:** the use of excavated materials to improve the quality of land areas that are considered degraded through mechanisms other than associated with wind farm construction (e.g. through cutting or erosion); the term is not used to describe reinstatement activities at infrastructure (and reinstatement footprints do not contribute to compensation metrics detailed elsewhere in the EIA Report).

Excavation volumes have been calculated based on infrastructure footprints and peat depths. All infrastructure footprints were split into 0.5 m depth categories (e.g. 0.0 – 0.5 m: soil, 0.5 – 1.0 m, peat, 1.0 – 1.5 m, peat, etc) and volumes calculated as the product of the sub area and depth within that area. This enables separation of peat and soil volumes within individual footprints.

Within each footprint in peat, the upper 0.3 m is categorised as acrotelm, and everything deeper as catotelm. A 0.3 m thickness of vegetation and underlying peat is a sufficiently thick continuous layer to avoid damaging the roots of the excavated vegetation and provide a coherent 'turf' to re-lay. Footprints with probed depths <0.5 m are categorised as soil.

4.1.1. Turbines, hardstandings, secondary crane pads and blade lay downs

Each turbine location will comprise a circular turbine foundation set within a main hardstanding, with three ancillary crane hardstandings and two hardstandings for blade laydown. In order to level the hardstanding surfaces for the cranes to operate, both cut and fill earthworks may be required, both of which require removal of soil / peat if present.

All footprints will be fully excavated to substrate and replaced with coarse aggregate (see **Chapter 4**). The main hardstandings must remain in place for routine maintenance and decommissioning, however, the blade laydowns, ancillary crane hardstandings and clearance areas may be reinstated. Plate 4-1 shows the layout for these infrastructure components.

Permanent and temporary excavation volumes have been calculated for each turbine, with a summary by infrastructure type shown on Table 4-1. Volumes are subdivided into soil (< 0.5 m), acrotelm, (<0.3 m where peat is present) and catotelm (>0.3 m where peat is present).

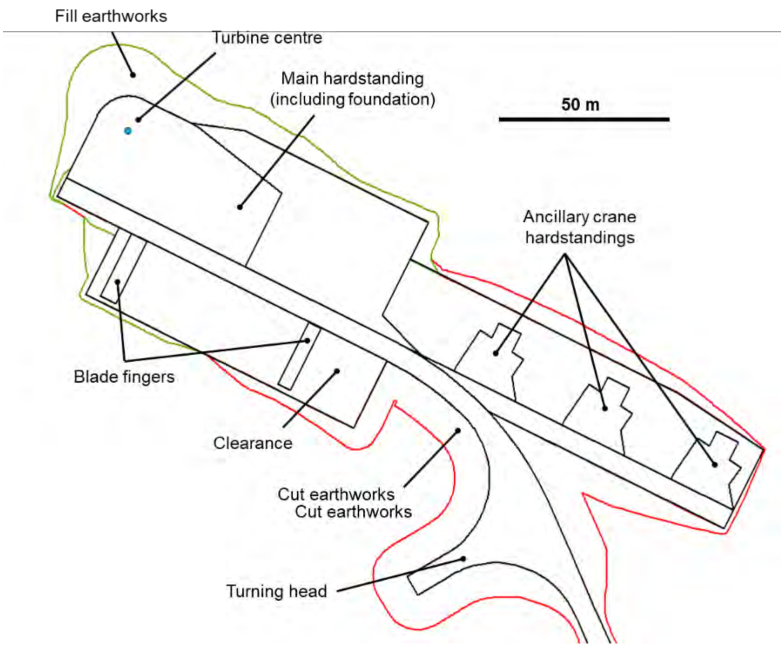

Plate 4-1 Indicative layout for turbines, hardstandings and track and indicative earthworks extents

4.1.2. Access tracks

Access tracks comprise a 6 m wide running surface and will be of cut and fill construction. Floating track is unsuitable at the Site due to the localised and patchy nature of peat deposits, and due to the moderate to steep sideslopes away from the summits over which many of the tracks have been routed (in order to avoid deeper peat). While there may be localised opportunities to micro-site tracks away from their current alignments, this would likely involve substantial increases in cut and fill requirements, reduce stability, increase the number of watercrossings and increase the landscape and visual impact from scarring of the hillsides. Estimated soil and peat volumes are shown on Table 4-1.

4.1.3. Cable trenches

Cable trenches are to be excavated alongside access tracks and all peat and soil excavated prior to cable placement will be directly reinstated after installation. Reinstatement is likely to be undertaken immediately after installation with very short-term sidecasting of materials, and therefore peat disturbed in this activity is not considered in the overall peat mass balance calculations.

4.1.4. Construction compounds

Two temporary construction compounds have been specified. The construction compounds will provide storage for site plant and materials and will be reinstated post-construction. It is intended that both construction compounds are used for peat reinstatement. Estimated soil and peat volumes are shown on Table 4-1.

4.1.5. Substation

The substation will be permanently excavated to substrate over a footprint of 150 m x 70 m. The excavated soil and peat volumes based on detailed probing are shown in Table 4-1. Figures are quoted to 1 m^3 to avoid rounding errors leading to inaccurate totals in later tables rather than to imply accuracy of calculations to 1 m^3.

Infrastructure	Type of Excavation	Excavation Volume (m^3)			
		Acrotelm	Catotelm	Total Peat	Soil
Permanently excavated					
Hardstandings	Permanent	773	1,085	1,858	3,640
Ancillary Hardstandings	Permanent	898	980	1,879	5,002
Track (temporary)*	Permanent / reformed	25	21	46	180
Track	Permanent	3,385	4,467	7,853	16,065
Fill Earthworks	Permanent	2,856	4,816	7,672	12,259
Cut Earthworks	Permanent	1,463	1,637	3,099	9,096
Clearance areas*	Permanent / reformed	628	794	1,423	3,219
Substation	Permanent	204	242	446	2,479
	Subtotal	**10,231**	**14,043**	**24,274**	**51,939**
Temporarily excavated					
Ancillary Hardstandings	Temporary	236	259	495	1,279
Track (temporary)	Temporary	19	15	34	94
Borrow Pits 2 & 3	Temporary	0	0	0	1,331
Construction Compounds	Temporary	0	0	0	2,723
Fill Earthworks	Temporary	1,225	1,901	3,126	4,962
Cut Earthworks	Temporary	282	281	563	6,636
Clearance areas	Temporary	872	986	1,857	6,146
Track (to compounds)	Temporary	98	125	223	383
	Subtotal	**2,731**	**3,567**	**6,298**	**23,554**
	Totals	**12,963**	**17,610**	**30,572**	**75,493**

Table 4-1 Peat and soil excavation volumes for all infrastructure (* although temporary infrastructure, soils / peat under their footprints is permanently excavated as part of permanent landscaping of infrastructure)

4.2. Reuse

Excavated peat will be reused in three ways:

1. Reinstatement of temporary excavations for infrastructure.
2. Landscaping of permanent infrastructure to minimise visual impacts of infrastructure.

3. A small area of forest-to-bog restoration adjacent to the substation and within the footprints of the two compounds.

Reuse proposals reflect the very limited opportunities to utilise peat in other ways, e.g. in forest-to-bog restoration (slopes are too steep, and the vast majority of forest is on steep slopes) or in repair of eroded areas (while habitats are not of the highest quality, neither are the summits eroded to the extent that translocated peat would be useful in repairing them. While borrow pits are proposed, they are far from areas of peat and located within steep slopes, so have been excluded for peat reuse.

Accordingly, reuse proposals are driven by the following key objectives:

a) Keep peat wet so that it retains its carbon store and best supports vegetation typical of the ground from which it was taken.

b) Minimise impacts on ground away from the immediate footprint of disturbance by either Proposed Development infrastructure or other existing site uses (e.g. forestry).

c) Where possible, avoid disturbance to hydrological continuity associated with peat being placed in the reuse location.

Reuse proposals are described below.

4.2.1. Reuse for forest-to-bog restoration at the site of the temporary compounds

The proposed substation and two temporary construction compounds are sited on Markreach Hill, primarily because this is one of the few low gradient areas within the Site not located at summit elevations or in the floodplain. The relatively gentle slope angles here also mean that peat is present around the hill flanks above Magmallach Burn, although proposed infrastructure generally avoids the peat in this area.

In order to construct infrastructure, existing forestry will be permanently felled, the ground will be levelled for the compounds, with earthworks around the periphery of each footprint. The total footprint, including a separation area between the two compounds is approximately 175 m x 75 m. Prior to forestry being planted, this area is likely to have comprised peatland of higher quality than now present under the forest canopy, and it is possible that peat depths were greater prior to ground preparations for forestry (ploughing), drying by uptake of water by trees, felling and then re-planting for second rotation.

It is proposed that post-construction, the compounds are stripped of their top surfaces, coarse aggregate, and then lined in preparation for permanent reinstatement of peat. The area between the two compounds will be graded in to the same level as the reprofiled compounds. Stripped materials (in particular coarse aggregate) may be used in combination with large grade rock to construct perimeter bunds around the four sides of the former compound area. An impermeable liner, ideally clay (and from site if possible) will be placed first, and then catotelmic peat placed to a depth of c. 0.7 m and acrotelmic peat to a depth of c. 0.3 m. There is a slight fall in elevation to the south, and the bund on the south side of area will be formed with openings along its crest to permit surface water within the acrotelmic peat to drain diffusively into the peaty area to the south. It is recommended that the bund is constructed along the access track alignment, which ultimately will be reinstated as it serves temporary infrastructure only.

In relation to the objectives of reuse:

- Larger contiguous areas of peat are more resilient to reuse than piecemeal reuse, and the proposed reinstatement area will be sufficiently deep and flat to minimise risks of drying – the boundaries of the deposit will be bunded in and lined, with the exception of the southern bund, and this will aid with water retention.

- The footprint has already been disturbed by two rotations of forestry and will be disturbed a third time by construction, and so the reuse will represent a positive change in ground conditions relative to its current, pre-construction condition.
- Hydrological continuity to the peat deposit to the south will be maintained by the crenelated southern bund crest.

Volumes associated with reuse of peat for compound reinstatement are shown in Table 4-2. Due to the relatively small area under consideration and because the primary purpose of this reuse is reinstatement, the 'restored' area is not considered in compensation metrics for the Proposed Development.

4.2.2. Reuse in forest-to-bog restoration west of the substation

An additional area of permanent felling is proposed to the west of the substation in a triangular footprint of 65 m x 35 m. While the ground here will not be levelled, gradients are gentle and it is proposed to utilise ground smoothing in combination with peat translocation to enhance peatland in this area.

Felling will be undertaken by cutting stumps as close to ground level as practical, subsequent to which stumps will either be flipped, pushed sideways into furrows, or if large (e.g. from a previous rotation) drilled to break them, before flipping or pushing. The surface will then be cross-tracked by low ground pressure vehicles before peat is translocated to this location. No impermeable liner will be required. Acrotelmic peat will be placed directly over the smoothed surface. Any bare areas will be spot turved with higher quality vegetation from the adjacent ride (to the west).

With regard to the objectives of peat reuse:

- The location sits below a slope that falls from the west into the target area, so therefore sheds water into the proposed reuse footprint, so peat should remain wet.
- The footprint has been disturbed by two rotations of forestry, and an open peat surface is preferable to tree cover (from a peatland perspective).
- The footprint will expand open habitat present in the ride, with rides offering the few areas of higher quality habitat in the lower slopes (e.g. Plate 3.3a).

Volumes associated with this reuse are shown in Table 4-2.

4.2.3. Reuse in reinstating temporary infrastructure

The remaining reuse proposals are focused on restoring areas of temporary infrastructure around turbines on the summits and ridges. In all locations, the proposed reuse comprises lining, bunding (on the downslope side) and placement of peat of c. 0.75 m depth on the upslope side of tracks within slopes cut back for hardstanding construction. Hydrological continuity to the deposits is provided by direct inflows of surface water from the slopes above the cut, maintaining wetness, while impacts beyond the construction footprint are avoided by undertaking reinstatement within the construction envelope.

Five locations are proposed for reuse, all in areas where peat is locally present and therefore the reinstated peat deposits are in keeping with local surroundings. The locations are shown on Figure

6.3.4, and proposed reinstatement volumes are shown in Table 4-2 ('Reuse in reinstating temporary infrastructure (other locations)'.

4.2.4. Reuse of carbon-rich and other soils

All non-peat soils will be reused in reinstating temporary infrastructure and in dressing and landscaping infrastructure that have not already been reinstated with peat. It is recommended that soils are placed slightly deeper on the upslope side of infrastructure (within cut earthworks) than on the downslope side (fill earthworks) as water retention will be better. Volumes are shown in Table 4-2.

Infrastructure	Re-use Volume (m^3)			
	Acrotelm	Catotelm	Total Peat	Soil
Reinstatement of temporary infrastructure (original locations)	2,731	3,567	6,298	23,554
Reinstatement of compounds	4,100	9,568	13,668	0
Reuse in forest-to-bog	558	0	558	0
Reuse in reinstating temporary infrastructure (other locations)	5,148	5,006	10,154	0
Reuse of soil in dressing / reinstating infrastructure	0	0	0	51,939
Totals	**12,538**	**18,140**	**30,679**	**75,493**

Table 4-2 Peat reuse volumes for all infrastructure

4.3. Peat Balance

The peat and soil balance for the Proposed Development is shown in Table 4-3 below. The table indicates that there is sufficient peat and soil to fully reinstate temporary infrastructure, provide dressing of permanent infrastructure and enable restoration of the small area of permanent felling adjacent to the substation. While slightly less catotelm is required than available and slightly more acrotelm is available than required, the overall balance is within c. 100 m^3 and therefore at this pre-consent stage, there is a reasonable degree of certainty that a material balance can be achieved with appropriate reuses.

Activity	Peat Balance (m^3)			
	Acrotelm	Catotelm	Total Peat	Soil
Total excavation during construction (Exc. Vol.)	12,963	17,610	30,572	75,493
Total re-use by direct reinstatement, wider reinstatement (including in compounds) and forest-to-bog (Re-use Vol.)	12,538	18,140	30,679	75,493
Peat mass balance (Exc. Vol. - (Re-use Vol. + Rest. Vol.))	**424 (Surplus)**	**-530 (Deficit)**	**-106 (Deficit)**	**0 (Balance)**

Table 4-3 Peat mass balance

Acrotelmic peat should be used as a substitute for catotelmic peat to achieve a balance, with the proviso that those areas of acrotelmic peat with the highest quality vegetation should be excluded from reuse deeper in reinstatement profiles. However, the vast majority of habitat intersected by infrastructure comprises grassland (NVC communities U2b or U20) with only a small area of M23a / U20 mosaic comprising less than 0.1 ha (excluding indirect impacts), and therefore this is not anticipated to be represent a substantial constraint on acrotelm reuse.

Section 5 summarises good practice for excavation, handling, re-use and monitoring associated with peat excavations at the Proposed Development.

4.4. Recommended storage locations

Where possible, in order to avoid multiple handling of peat, excavated materials will be transported directly to their point of reuse. Where this is not possible, for example due to construction phasing e.g. a requirement to temporarily store adjacent to foundation working areas prior to reinstatement, storage will be required locally. In these cases, it is important to ensure peat is stored safely with minimal risk of instability of stored materials while they are kept in good condition prior to reinstatement. Given the relatively limited extent of gentle (< 3°) and neutral terrain near turbine locations, attention should be given to the careful demarcation of temporary storage areas and to retaining measures to ensure stability on the upper slopes (although it is unlikely that any shallow slippage, were it to occur, would extent much beyond the upper treelines that site below the summits, see **Technical Appendix 6.4**).

Section 5 provides good practice advice on peat storage.

4.5. Additional measures to restore peatland

The summits and ridgelines at elevation within the Site have been subject to artificial drainage over relatively wide areas, and the NEMP includes prescriptions for drain blocking to help slow the flow of water from the summits, increase ground wetness and make these areas more suited to higher quality bog vegetation.

5. GOOD PRACTICE

5.1. Background

Good practice measures in relation to peat excavation and reuse are now generally well defined following a number of years of practice (at wind farm sites) across the UK and Ireland. In Scotland in particular, there is an increasing body of experience relating to peat restoration, facilitated by Peatland Action (Scottish Natural Heritage, 2017). As a result, there are a number of specialist contractors who have experience in the planning, design and implementation of peat restoration works in the Scottish uplands. A key step in delivering the restoration proposals described above is identification of appropriate contractors to implement the restoration plans at each location.

The sections below outline good practice measures related to excavation and handling, storage, and reinstatement and restoration of peat in association with wind farm construction.

5.2. Excavation and handling

The following good practice measures are proposed for excavation and handling:

- A minimum thickness of 0.3 m of acrotelmic peat or turved organic soil should be excavated where sufficient soil is present; where less than 0.3 m is present, the full depth of soil and surface vegetation should be excavated.
- Excavation and transport of peat/soil shall be undertaken to avoid cross-contamination between soil horizons (e.g. organic soil and underlying mineral soil / substrate).
- Where possible, cross-tracking of plant over undisturbed vegetation should be minimised, and excavated materials transported to their storage locations along constructed track.
- If working is required away from constructed roads / tracks, the use of long reach excavators should be encouraged in order to minimise cross-tracking.
- If landscaping of road / track margins is required for temporary works, it is preferable for vegetated organic soils to be used for this purpose rather than acrotelmic peat (which should be stored).
- Wherever possible, double handling of peat should be minimised (in particular for catotelmic peat) by direct transport of materials to their point of storage.
- For excavations:
    - Use of appropriate supporting structures around peat excavations (e.g. for turbines, crane pads and compounds) to prevent collapse and the development of tension cracks.
    - Avoid cutting trenches or aligning excavations across slopes (which may act as incipient back scars for peat failures) unless appropriate mitigation has been put in place.
    - Implement methods of working that minimise the cutting of the toes of slope, e.g. working up-to-downslope during excavation works.
    - Monitor the ground upslope of excavation works for creep, heave, displacement, tension cracks, subsidence or changes in surface water content.
    - Monitor cut faces for changes in water discharge, particularly at the peat-substrate contact.

  - Minimise the effects of construction on natural drainage by ensuring that natural drainage pathways are maintained or diverted such alteration of the hydrological regime of the site is minimised or avoided; drainage plans should avoid creating drainage/infiltration areas or settlement ponds towards the tops of slopes (where they may act to both load the slope and elevate pore pressures).

- For cut tracks:
  - Maintain drainage pathways through tracks to avoid ponding of water upslope.
  - Monitor the top line of excavated peat deposits for deformation post-excavation.
  - Monitor the effectiveness of cross-track drainage to ensure water remains free-flowing and that no blockages have occurred.
- For floating tracks:
  - Allow peat to undergo primary consolidation by adopting rates of road construction appropriate to weather conditions.
  - Identify ‘stop’ rules, i.e. weather dependent criteria for cessation of track construction based on local meteorological data.
  - Run vehicles at 50% load capacity until the tracks have entered the secondary compression phase.
  - Prior to construction, setting out the centreline of the proposed track to identify any ground instability concerns or particularly wet zones.
-

5.3. Storage

The following good practice measures are proposed for storage:

- Eliminate storage where possibly by single handling from the point of excavation to a location of reuse.
- If storage cannot be avoided, minimise storage time by taking an holistic approach to excavation and restoration such that catotelmic peat (in particular) is used as soon as possible after excavation.
- Store excavated acrotelmic and catotelmic peat separately during excavation works, which will be undertaken by an experienced contractor specialising in peat groundworks and restoration.
- Acrotelmic peat and turved soil blocks should be stored turf side up to prevent damage to vegetation.
- Storing in areas of minimal gradient where 'runoff' or drainage away from the point of storage is minimised (these areas will also satisfy to avoid areas of lower stability).
- Where possible, avoid storing peat on slope gradients >3° and preferably store on ground with neutral slopes and natural downslope barriers to peat movement; if steeper slopes are required, construct temporary retaining structures.
- Ensure stored peat is not located upslope of working areas or adjacent to drains or watercourses.

- Fewer, larger stores will be preferable to a greater number of small stores, since the total potential area of drying surface will be less.
- Where storage is required in the medium term, preparing the peat to minimise the surface exposed to drying (e.g. through blading off of catotelmic peat and use of appropriate cover to minimise moisture loss).
- The Environmental and Ecological Clerk of Works (ECoW) should work with an appointed Geotechnical Engineer (GE) to review the placement and condition of stored peat.
- Storage areas should be outside any area identified in the PLHRA as of 'Moderate' or greater likelihood (see **Technical Appendix 6.4**) and should be more than 50 m away from watercourses, away from sensitive habitats and away from the edge of excavations.
- Undertake site specific stability analysis for all areas of peat storage (if on sloping ground) to ensure the likelihood of destabilisation of underlying peat is minimised.
- Peat and soil stores should be appropriately bunded to prevent risks from material instability and prevent runoff of sediment and water from the stockpiles
- The condition of the excavated peat, in particular its moisture content, should be regularly monitored and local water utilised to periodically 'refresh' stored peat and prevent desiccation.
- A Sustainable Drainage System (SuDS) should be implemented to control water and sediment loss during storage (this also applies to reinstated areas, see below).
- Monitor effects of wetting / re-wetting stored peat on surrounding peat areas, and prevent water build up on the upslope side of peat mounds.
- Undertake regular monitoring of emplaced peat in restoration areas to identify evidence of creep or pressure on retaining structures (dams and berms).
- Maximise the interval between material deliveries over newly constructed tracks that are still observed to be within the primary consolidation phase.
-

5.4. Reinstatement and Restoration

The following good practice measures are proposed for reinstatement and restoration:

- Where possible, turves and underlying catotelmic peat should be reinstated at the locations from which they were removed.
- Any bare peat exposed at the surface of a reinstated area should be seeded with a locally appropriate seed mix or translocated vegetation.
- Where insufficient turves are available to full cover reinstated soils, a checkerboard pattern of turf blocks should be used, with turf squares no less than 1 m^2 to act as seed points interspersed amongst the bare areas.
- Reinstated ground levels should tie in with the surrounds, and any bulking up should be avoided by tamping down soils and turves.
- If appropriate, temporary fencing may be required to enable vegetation to establish following reinstatement works and prevent damage by livestock, deer or rabbits.

5.5. Monitoring

During construction, monitoring should be undertaken in any areas where peat is stored, as follows:

- All construction activities and operational decisions that involve disturbance to peat deposits should be overseen by an appropriately qualified geotechnical engineer with experience of construction on peat sites.
- The geotechnical risk register prepared prior to construction should be updated with site experience as infrastructure is constructed.
- A weather policy should be agreed and implemented during works, e.g. identifying 'stop' rules (i.e. weather dependent criteria) for cessation of track construction or trafficking.
- Full site walkovers should be undertaken at scheduled intervals to be agreed with the Local Authority to identify any unusual or unexpected changes to ground conditions (which may be associated with construction or which may occur independently of construction).
- Monitoring checklists should be prepared with respect to peat instability addressing all construction activities proposed for site.
- Regular visual inspection of the outer peat surface of any stored peat to identify any evidence for drying or cracking.
- Awareness of peat instability and pre-failure indicators should be incorporated in site induction and training to enable all site personnel to recognise ground disturbances and features indicative of incipient instability.
- Regular coring of stored peat to log the moisture content of stored peat (using the von Post scale to monitor changes in moisture content for peat on the outside and within the peat mound).
- Clear specification of an action plan in response to these observations, including modifications to coverings, implementation of watering, or construction of temporary berms to retain water in the storage footprint.
- Acceleration of re-use for vulnerable stores if so identified.

Key to the success of the strategy for peat management will be careful monitoring of the post-construction works and any restoration activities. A monitoring programme should be initiated once restoration and peat reinstatement works have been completed, and should include:

- Review of % vegetation cover and vegetation composition in areas of bare peat that have been reinstated or in any areas that have been seeded (due to a lack of available turved material).
- Review of stability of deposits in their new locations.
- Full site walkover to look for signs of unexpected ground disturbance, including:
    - Ponding on the upslope side of infrastructure sites and on the upslope side of access tracks.
    - Changes in the character of peat drainage within a 50 m buffer strip of tracks and infrastructure (e.g. upwelling within the peat surface upslope of tracks, sudden changes in drainage behaviour downslope of tracks).
    - Blockage or underperformance of the installed site drainage system.
    - Slippage or creep of stored peat deposits.

    - Development of tension cracks, compression features, bulging or quaking bog anywhere in a 50 m corridor surrounding the site of any construction activities or site works.

- Fixed point photography in order to aid review over a series of monitoring intervals.

If required, mitigation recommendations should follow from the monitoring and include:

- Specification of seeding appropriate to the target vegetation or stabilisation with geotextile if revegetation is not occurring naturally (which will assist re-wetting and retention of moisture contents).
- Construction of wood dams (or equivalent) if any creep of peat soils is evident at any restored location.

Monitoring should be carried out for a minimum of five years after construction and reinstatement works have concluded.

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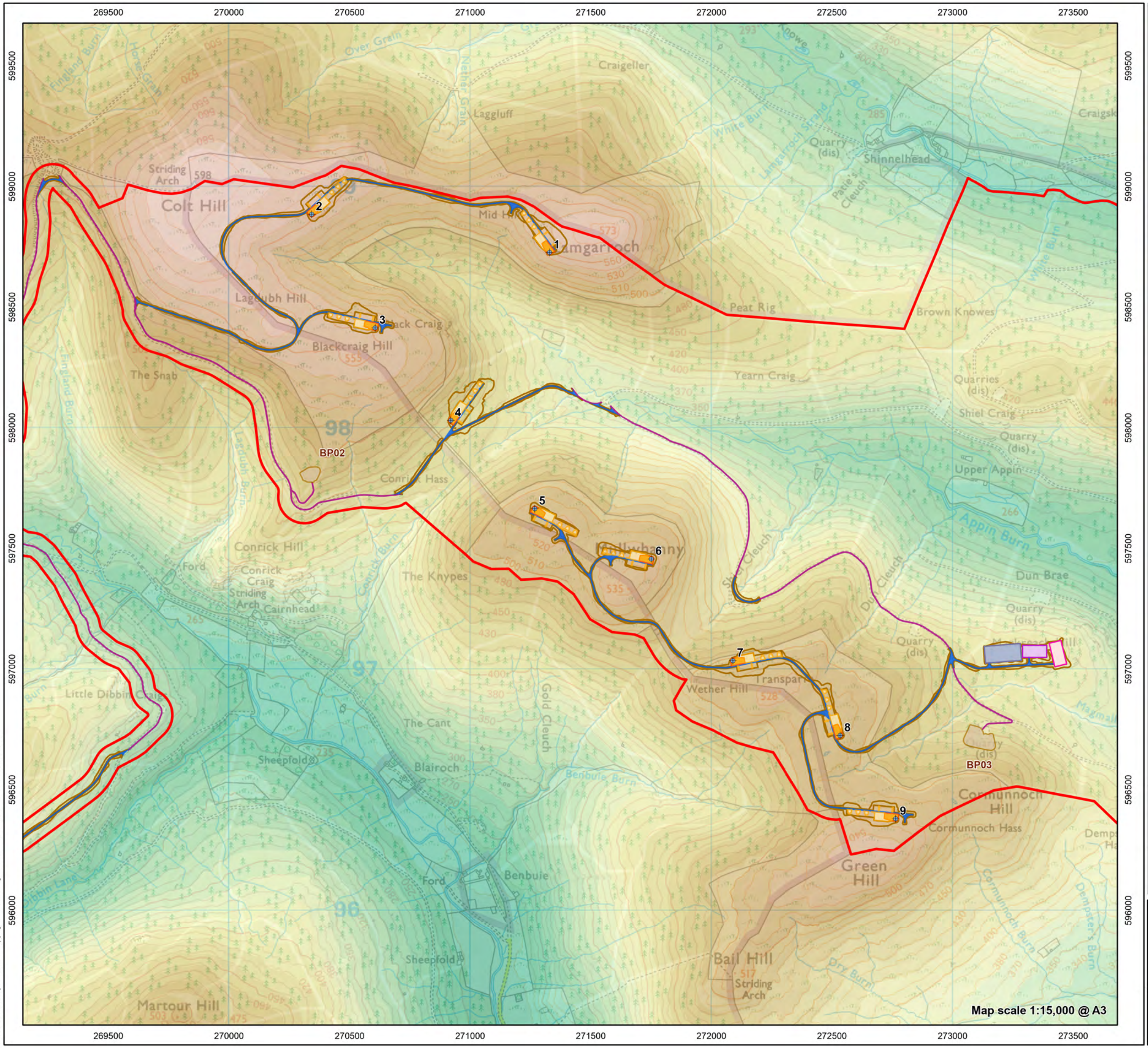

Statkraft

N

- Site Boundary
- Turbine
- Substation
- SPEN Construction Compound (Temporary)
- Proposed Development Construction Compound (Temporary)
- Borrow Pit (Temporary)
- Hardstanding (Temporary)
- Hardstanding (Permanent)
- New Access Track
- Existing Access Track (Upgraded)
- Earthworks

Elevation [m]

- 201 - 220
- 221 - 240
- 241 - 260
- 261 - 280
- 281 - 300
- 301 - 320
- 321 - 340
- 341 - 360
- 361 - 380
- 381 - 400
- 401 - 420
- 421 - 440
- 441 - 460
- 461 - 480
- 481 - 500
- 501 - 520
- 521 - 540
- 541 - 560
- 561 - 580
- 581 - 600

0 0.5 1 Km

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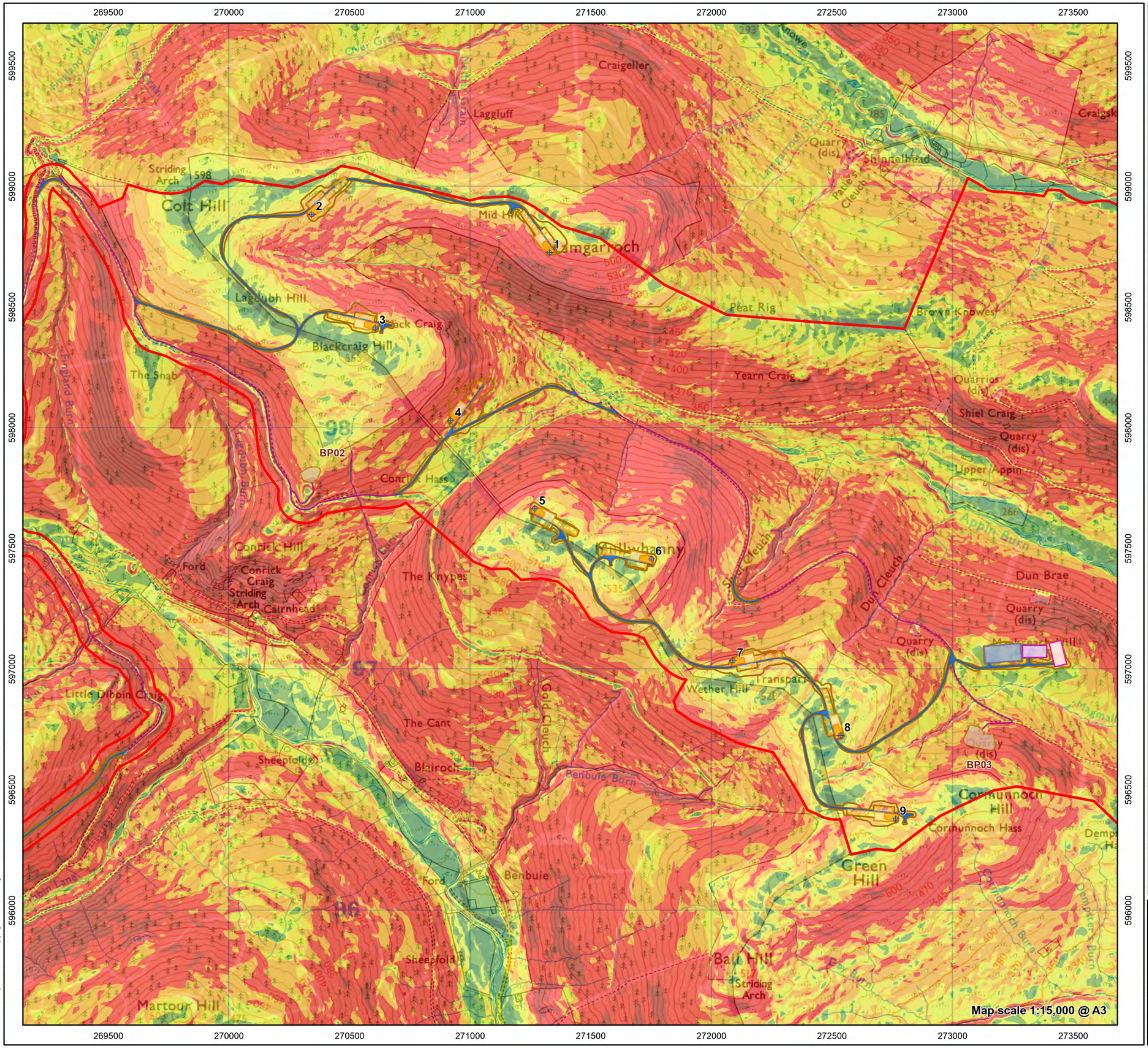
Checked By: AM
Version: 01

Date: 15/04/2025
Ref: 0045_Appin

Figure 6.3.1 Elevation

Appin Wind Farm
EIA Report



Statkraft

N

- Site Boundary
- Turbine
- Substation
- SPEN Construction Compound (Temporary)
- Proposed Development Construction Compound (Temporary)
- Borrow Pit (Temporary)
- Hardstanding (Temporary)
- Hardstanding (Permanent)
- New Access Track
- Existing Access Track (Upgraded)
- Earthworks

Slope [°]

- 0.0 - 2.5
- 2.5 - 5.0
- 5.0 - 7.5
- 7.50 - 10
- 10.0 - 15.0
- 15.0 - 25.0
- > 25.0

0 0.5 1 Km

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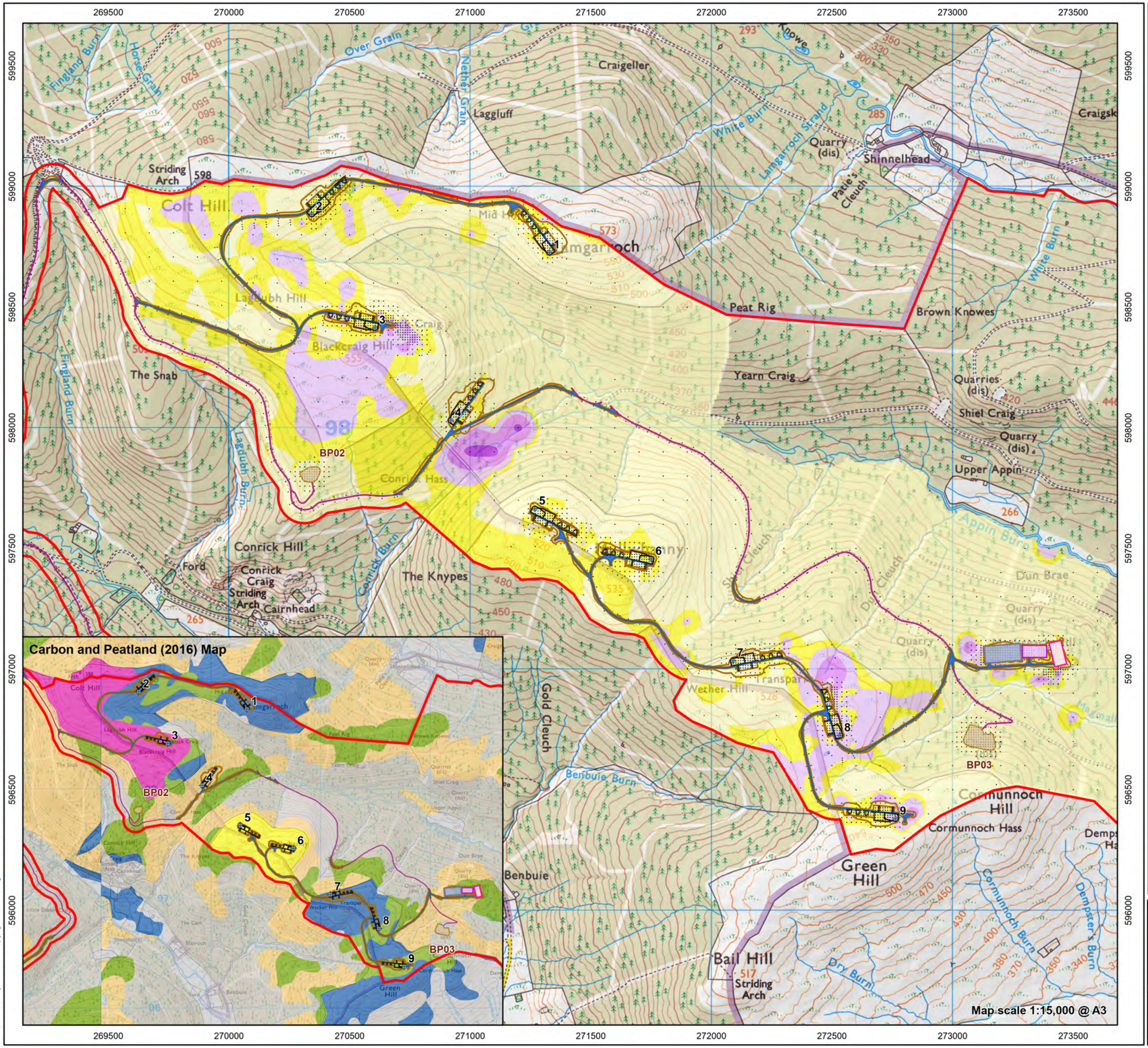
Figure 6.3.2 Slope

Appin Wind Farm EIA Report



Statkraft

N

- Site Boundary
- Turbine
- Substation
- SPEN Construction Compound (Temporary)
- Proposed Development Construction Compound (Temporary)
- Borrow Pit (Temporary)
- Hardstanding
- New Access Track
- Existing Access Track (Upgraded)
- Earthworks
- Probing Locations

Peat Depth [m]

- <= 0.3
- >0.3 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 3.0
- >3.0 - 4.0
- >4.0

Carbon and Peatland (2016) Map (Inset)

- Class 1
- Class 2
- Class 3
- Class 4
- Class 5
- Mineral Soil
- Unknown Soil
- Non Soil

[Layer offsets shown on map occur within dataset and are not a display error]

0 0.5 1 Km

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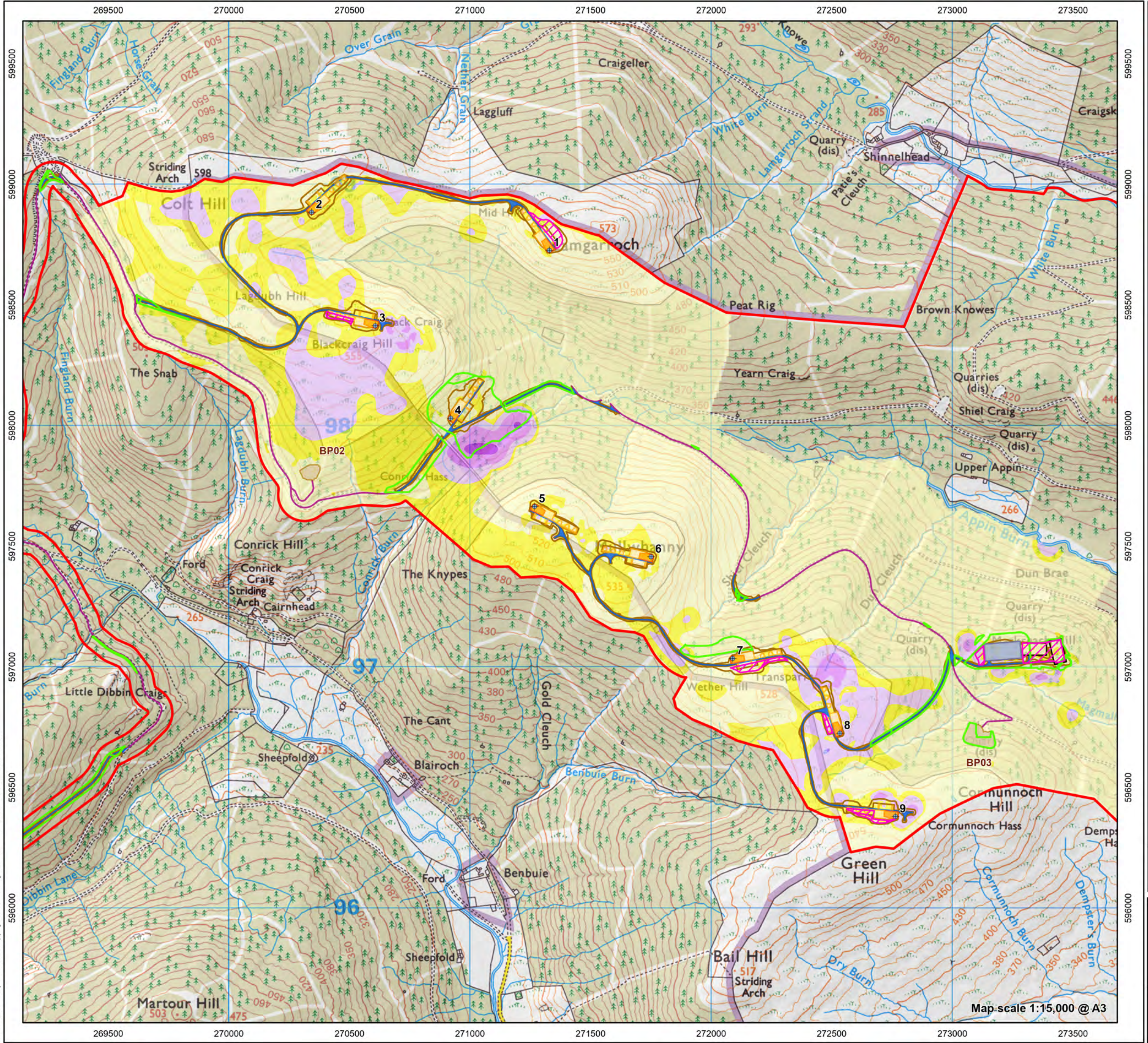
Figure 6.3.3 Peat Depth

Appin Wind Farm EIA Report



Statkraft

- Site Boundary
- Turbine
- Substation
- Construction Compound (Temporary)
- Borrow Pit (Temporary)
- Hardstanding (Temporary)
- Hardstanding (Permanent)
- New Access Track
- Existing Access Track (Upgraded)
- Earthworks
- Peat reuse areas
- Permanent felling

Peat Depth [m]

- <= 0.3
- >0.3 - 0.5
- >0.5 - 1.0
- >1.0 - 2.0
- >2.0 - 3.0
- >3.0 - 4.0
- >4.0

0 0.5 1 Km

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Figure 6.3.4 Peat reuse locations

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EIA Report