CWIF-WAYFARER

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STROUPSTER PLI
PRECOGNITION OF STUART YOUNG
PEAT STABILITY ISSUES

CWIF-W acknowledges that the FEI Addendum Peat Stability Assessment (APSA) addresses the instability issues associated with the construction of the turbines and access roads, and that there are no significant issues which cannot be overcome by good construction management.

CWIF-W is not convinced that adequate thought has been given in the Draft Construction Management Plan (DCMP) to the controls needed to ensure that man-made risk is managed and in particular that a proper methodology needs to be developed for deep peat excavation for turbine bases etc. However, this can be overcome by Conditions, and in view of the nature of the risk, CWIF-W recommends that Highland Council impose a condition that all detailed method statements for working in deep peat are scrutinised by a Civil Engineer responsible to Highland Council, and indeed that professional supervision responsible to Highland Council is deployed on site throughout bulk excavation works.

CWIF-W is concerned that while the peat issues associated with the excavation and re-instatement of the borrow pit permanent works are reasonably well developed, (with some issues remaining to be addressed) there has been no thought given to the implications of the temporary works required to achieve construction and reinstatement of the borrow pit on the stability of peat, maintenance of drainage, preservation of habitat, and elimination of risk of loss of stability.

The issues remaining to be addressed referred to above are these:

- Recommendations for construction of the access roads warn against interference with drainage, surcharge of the adjacent peat, and lengthy exposure of cut faces, yet the temporary works associated with removal and reinstatement of the overburden on the borrowpit footprint require a 2 metre high stockpile of peat or drift to be stored on areas where the peat has been assessed by interpolation as being up to 4 metres deep (Drawing No 5).

- Although not described in detail, but necessary, and shown in the Borrowpit cross sections on Figure BP4, the cut face of the excavation surrounding the borrowpit will require to be dressed to a slope for stability, and as this will entail the removal of the more stable upper peat layer, then a permanent, wide, exposed, and vulnerable leading edge of peat will be presented to the atmosphere for drying out, and this edge will be constantly fed with moisture seeping below from higher up the hillside, particularly at

the top of the borrow pit where it can be seen from Drawing 5 that the slopes are in the range of 4-8˚.

- Clause **1.1 Background** indicates that one of the factors likely to influence the potential for peat instability is "The presence of slope gradients greater than 4˚ (approximately) and general topography."

- The method for creating a rock retaining wall in deep peat to allow excavation of turbine bases is in principle satisfactory but it is undeveloped. At Whitelee Windfarm near Glasgow the contractor used a similar approach by punching large rocks into the peat to create a subsurface retaining wall. The borrowpit is not likely to yield suitable material for this and it would therefore have to be imported requiring considerably more lorry movements.

The principle omission from the Addendum Peat Stability Assessment, and from the Draft Construction Method Statement (DCMS), lies in its failure to consider the temporary condition during construction where the proposed methodology requires the excavation and transportation of large quantities of peat and drift material and its deposition nearby on top of peat which is already potentially up to 4 metres deep.

This is contrary to the advice given not to surcharge the peat, and how would it actually be achieved in practice?

In the first place, the depth of peat generally around the borrowpit entrance is in the region of 4 metres. Therefore the approach road will have to be constructed at the drift level, necessitating wide peat excavation with gently sloping sides to allow the road to arrive at the entrance to the quarry at quarry floor level. This will require an area in front of the entrance to be cleared of peat to allow safe vehicle movements, and the temporary movement and storage of the large quantity of peat to make the road and manoeuvering area will be a substantial logistical problem in itself.

Doosan Moxy dumptrucks http://www.doosanmoxy.com/Products/ADT.asp have an average ground clearance of 600mm or thereabouts and the top of the cab is around 3 metres above the road. There is no vehicle used in normal construction practice which can carry 20 tonnes or more across 4 metre deep peat, therefore an alternative solution to the logistical problem is needed.

For vehicles to transport and deposit the excavated material in the bund areas, temporary roadways will be required, and these will have to be founded on the drift layer. One practical solution to the problem might entail the creation of a series of comb-shaped parallel roads constructed east to west into the bund areas, the peat overburden being deposited on the undisturbed areas between the roads. As the undisturbed areas will compact under load, and the excavated peat will adopt its own angle of repose which will vary with initial moisture content and weather, the roads will have to be quite wide to start with. The roadways will then be progressively filled with peat or drift from the borrowpit excavation, delivered by dumptruck and placed with long-reach 360˚ tracked excavators.

This is one way the logistical problem can be resolved. However, the ecological problems this solution brings are insurmountable. The first vehicle which travels from the quarry mouth to the outer extents of the two bund areas will destroy the north-south hydrology over a quarter of a mile width of hillside.

The way natural drainage works in peat is described in Appendix 1 Peat Stability which concludes with:

> **"It is important to realise that a natural and undisturbed peat upland peat bog will absorb all of the precipitation that falls on its surface and transmit the water to the lower slopes in a controlled manner through a range of interconnections that operate at different scales and speed[9]. Failure to understand this and to disrupt the transmission process for the groundwater could result in instability."**

The "range of interconnections operating at different scales and speeds" will deliver the precipitation absorbed by the hillside above the borrowpit and bund areas to the 4 metre deep sump in the overlying peat created by the temporary works, and the natural exits will have been destroyed. The deposited and residual peat will become waterlogged and the superficial temporary 2 metre depth of disturbed peat overburden will be founded on a porridge of saturated peat.

The gradients are low, but the risk of slippage is high.

Please also note:

- The volume of disturbed peat in the bund area would be the equivalent of the football pitch at Wembley filled with vertical sided peat to a depth of 25 metres.
- The small peat bunds surrounding the borrow pit will control surface water run-off only, leaving the "range of interconnections" to feed water into the excavations uncontrolled.
- The shallow catch ditch at the entrance to the borrow pit will be situated at the foot of the 4 metre deep cut face of the excavation to create the entrance at quarry floor level and there will be nowhere to discharge it to.

The APSA draws attention to

Policy Planning Guidance Note 14– *'Development on Unstable Land'* (PPG14),

yet the proposed construction methodology creates the very conditions described in Clause A46 of

Appendix A- Causes of Instability

> ***A46. Landslide movement may be initiated by natural processes or by human activities. Table A1 illustrates some of the processes affecting hillslopes which may increase the likelihood of movement. Slopes will only move if the forces contributing to movement (eg gravity, water pressure, etc) exceed those resisting movement (eg strength of material, frictional resistance, etc).***
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> ***Movement can be initiated by changes in any of these factors individually or in combination. For example, undercutting of slopes by coastal or river erosion or by excavation removes support from the foot of the slope and thus reduces the resistance to movement. Loading of the top of slopes by natural deposition, tipping or by construction of buildings increases the weight (load) of the top of the slope, thus contributing to movement. Increases in water content due to heavy rainfall or alteration of drainage may increase water pressures and thus decreases the resistance to ground movement.***

The planning of this project is superficial. The DCMS states that:

> **"A preliminary peat probing exercise has taken place and has informed the *siting of all wind farm elements."***

This is clearly not true. The site layout has not changed since April 2005 and examination of APSA **Drawing 5 - Peat Depth Interpolation** shows:

- The access track to Turbine A passing through peat up to 4.5 metres deep when an easy diversion to the west would take it onto ground with less than 1 metre depth.
- Turbine A is located on peat 3.5 metres deep whereas a small shift south-west would move it to shallower depths.
- The access track between turbines C and D still follows a line which takes it through the deepest recorded peat on site at 5 metres.
- The access road to the borrowpit goes through peat up to 4 metres deep.
- The APSA states that "***Wherever possible, the following principles should be adopted:***

  Access roads should float on the 'peat'. This will not be possible where the peat exceeds a certain thickness. The detail design will determine what can be achieved but it is likely that peat up to 2m could be accommodated."

There is no detailed discussion or drawings of roads constructed through 4 metre deep peat.

The engineering and ecological implications of the foregoing bullet points have not been addressed. These are not matters which can be dealt with by Conditions. The means of handling and disposing of large volumes of material in the construction of the development must be resolved before consent can be given. The environmental risks and indeed Health and Safety implications of a major instability event are so severe that they must be properly resolved before consent can be given.

Although one solution to the temporary storage of peat would be to move the temporary bunds to a different location where there were no instability issues, it would still leave the problem of deep peat excavations to construct the road to the quarry entrance creating a 4 metre deep sump.

It is considered that both these issues are so far removed from the proposal before us that a fresh Planning Application would be required to address their implications.