



**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL

A REVIEW OF THE HYDROGEOLOGY ELEMENT OF THE
CALLIACHAR WIND FARM ENVIRONMENTAL
STATEMENT

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Section 1

Location of the Calliachar site

The Calliachar site is located in Glen Quaich, between Loch Tay and Amulree.

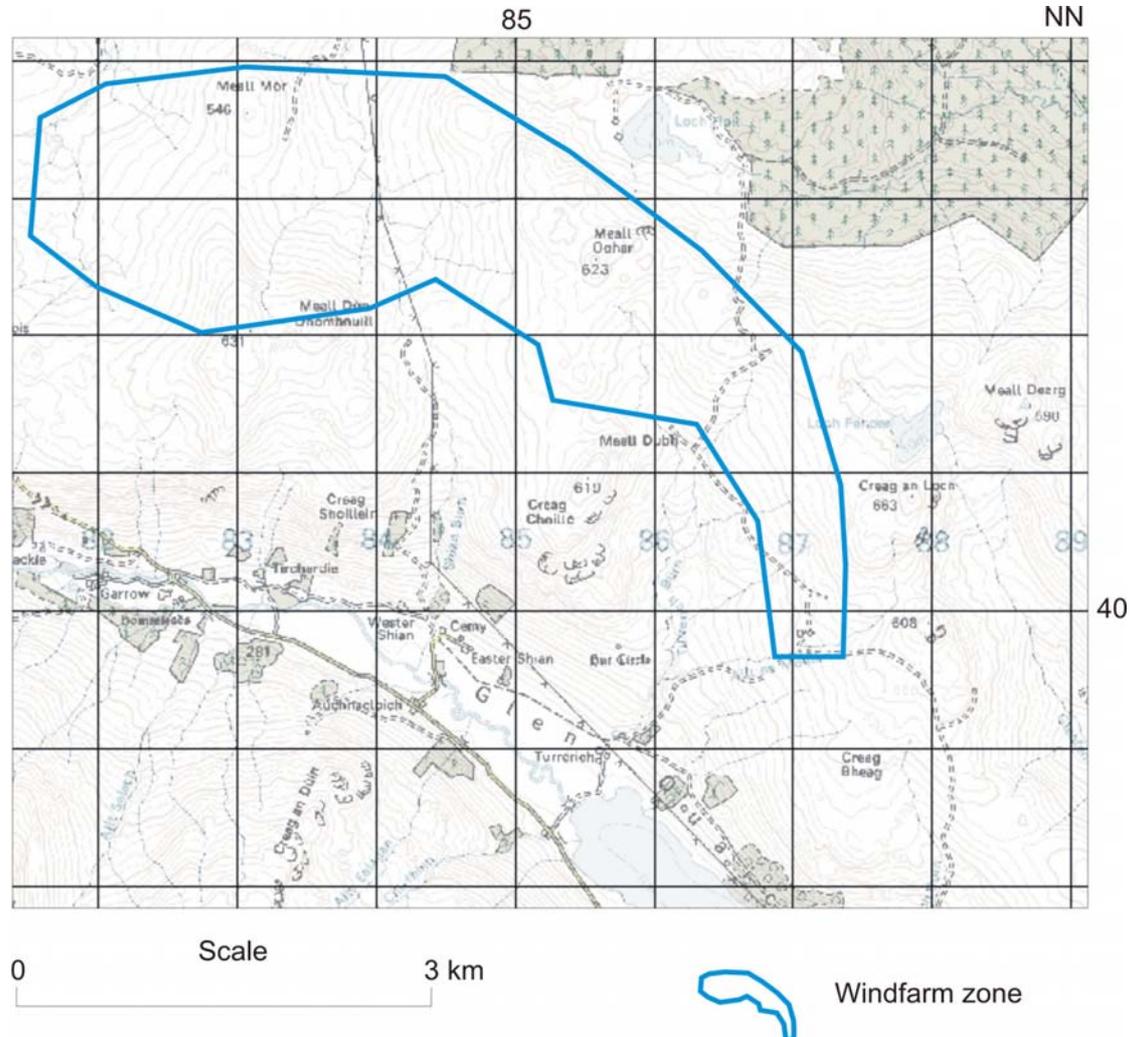


Figure 1: Location of Calliachar

1 Geology

Superficial Deposits

Much of the lower and middle hillside at the site is underlain by thin, patchy glacial till with mainly peaty deposits along the hill tops. The till is a predominantly clayey, stony deposit with occasional coarser-grained sand and gravel horizons. It varies in thickness from less than 1 m to more than 10 m locally. The proposed area for turbine installation is underlain by generally thin superficial deposits, with bedrock either at or close to the ground surface.

Alluvium is mapped to the north and south of the site associated with the River Tay and the River Quaich respectively. Typically, these comprise poorly consolidated sands, gravels, silts and clays.

Bedrock

Precambrian semipelite metamorphic rocks underlie the whole site (Figure 2) with areas of igneous intrusions. The semipelite rocks belong to the Southern Highland Group. These are hard, fractured rocks that have been subjected to heat and pressure to form complex structures. The upper few metres of the rock are normally highly fractured as a result of glacial activity and weathering processes.

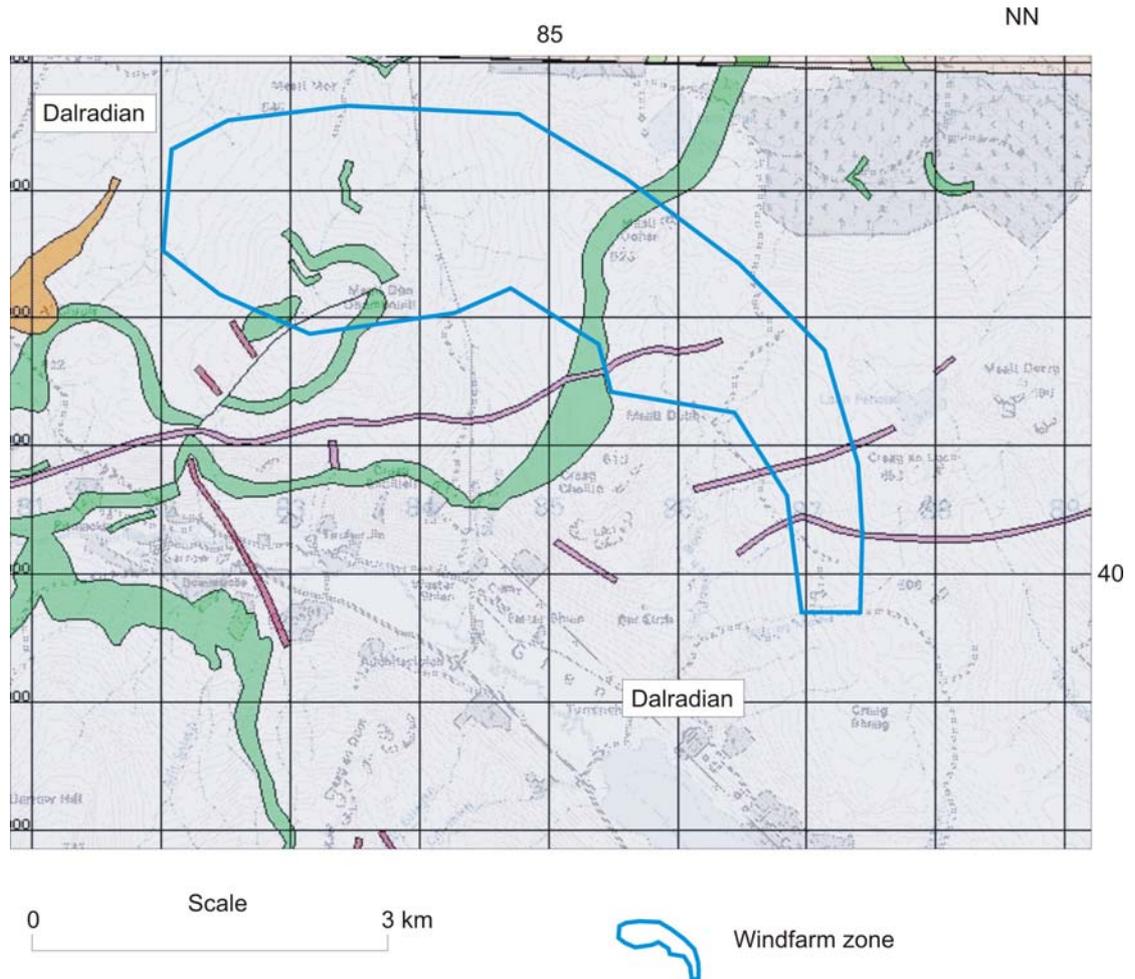


Figure 2: Bedrock geology

2 Hydrogeology

Superficial deposits

Groundwater is present in relatively small amounts mainly within sandy, gravelly beds interbedded with till deposits. These are common in the area, particularly on the lower slopes of the valleys where significant flows of groundwater are present. These can form useful, but vulnerable, domestic supplies. However, the main body of till itself can also have a significant permeability owing to the sandy nature of the

material and the presence of fissures and fractures. The groundwater flow paths in till are very localised and can be complex. The pathways are influenced mainly by surface topography and the presence of higher-permeability beds of sand and gravel which occur sporadically. We have no data on the hydrogeology of the project area.

Bedrock

The upper weathered zone of the semipelite and igneous intrusions is the principal layer where groundwater is present. Here, the permeability of the rock is locally relatively high because of openings in the rock formed during glaciation. Rainwater can infiltrate to this layer either by a direct pathway where the rock is exposed or via the basal beds of the superficial deposits. From this layer, groundwater moves down slope to either appear at springs or to provide seepages to alluvial beds on river flood plains.

Section 2: The Environmental Statement review

The ES has been produced by I & H Brown Calliachar Ltd and is dated February 2004.

The proposal is for the construction of up to 46 turbines near Aberfeldy (NN 854 425).

Chapter 5: Environmental Management

Chapter 6 Key Findings:

Annexe C: Geology, Hydrogeology and Hydrology

Geology

Annexe C: 2.2.1 covers the geological description. BGS maps for the area have been used in the description.

Overall, an accurate summary, although mention should be made of the nature of the superficial Deposits (mainly till and peat).

Hydrogeology

Annexe C: 2.2.2 refers to the BGS hydrogeological map of Scotland. Recognition of the relatively low amount of groundwater held in storage in the bedrock is made but that groundwater may occur where the rock is fractured or weathered. It is also recognised that significant quantities of groundwater may occur in the alluvium and contribute to baseflow in nearby rivers.

No mention is made of the potentially significant shallow groundwater present in the sandy and gravelly till deposits found on the lower and middle slopes of the valley, nor the shallow weathered bedrock zone. These could be important when considering the potential impact on surface waters and private water supplies. A more detailed description of these water0bearing zones is required.

Groundwater vulnerability

SEPA's latest vulnerability maps, produced by BGS, indicate that fractured bedrock with thin or no sandy till cover is highly vulnerable to pollution. However, these maps are not available to consultants yet. Therefore, I & H Brown Calliachar Ltd has, correctly, used the latest publicly accessible data sources.

Receptors

Private water supplies: C: 2.2.2 mentions that there are no springs or wells mapped within the site boundary and that Perth and Kinross Council Environmental Services department have no registered private water supplies within a 1 km radius of the boundary of the site. Several spring fed supplies within the Shian Burn catchment are

identified but are not considered to be at risk. Para. 6 in C 2.2.2. refers to springs in the Turrerich Burn catchment, although no details of locations or properties are given.

It is possible that some of the spring supplies on the hill slopes above Glen Quaich may result from shallow flow within the till in the site area, however the risk from operational activities on these supplies is considered to be low. In view of the fact that the precise locations of the springs are not provided means that a proper risk assessment cannot be made.

Recognition should be given to the presence of deeper groundwater. Where the bedrock is locally fractured and weathered it has the potential to supply significant quantities of water. Due to the fractured nature of the bedrock, rapid flow can occur and sources some distance away can be affected, although it is unlikely that any deep abstraction boreholes located more than 2 km from the margins of the development area would be affected.

Surface water:

C: 2.2.3 describes the hydrology of the area and notes that there are a number of surface water features in the site area, such as burns and lochs, the quality of which could be affected by construction and maintenance works associated with the proposed scheme.

Table 6.1 considers that the residual effect during operation of the interception of groundwater flow and surface water run off causing disruption of the natural flow into burns and the Turrerich Burn sub-catchment is insignificant.

Operational phase activities are considered by BGS to be insignificant. However, BGS considers that groundwater baseflow to the streams may be important. Therefore, the construction of tracks and borrow pits some distance from the burns may have a temporary effect on the quality of water in them. This is unlikely to be significant, but the report should recognise the role of shallow groundwater flow in bedrock and drift deposits as baseflow to surface streams.

Groundwater-dependent ecosystems

C: 2.2.3 refers to the designation of the River Tay as a SAC and the SSSI to the north of the site.

Table 6.1 considers the discharge of sediment into nearby water bodies from surface water run off during construction, operation and decommissioning to be insignificant.

BGS consider that there may be a minor, localised, impact on surface waters during construction, but that this is considered to be temporary and low risk.

Monitoring

5.3.1 (p. 37) states that routine weekly quality inspections of sensitive environmental features in the vicinity of the site (e.g. burns and lochans) will be carried out.

It is very important that groundwater-fed private water supplies including springs that could be affected by the construction works should be included in the monitoring programme.

Conclusions

- Shallow groundwater in the sandy till and weathered bedrock zone may be providing significant amounts of groundwater as baseflow to streams and the springs.
- Whilst BGS consider the overall risk to groundwater receptors as low, there may be local impacts on shallow groundwater with temporary reductions in water quality.
- It is possible that some of the properties located 2 or 3 km from the site margins may be fed by spring supplies that are much closer to the development. The catchment areas for these sources may include the development site and those considered most at risk should be included in the monitoring programme.
- More work is required on determining details of the spring supplies on the slopes above Turrerich and Shian.

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