

Our Ref:

Your Ref:



13 September 2012

Land Use Consultants  
43 Chalton Street  
London  
NW1 1JD

**For the attention of Juliette Young**

Dear Madam,

**Mainstream Renewable Power  
Proposed Onshore Works for Neart na Gaoithe Wind Farm  
Flood Risk Statement for proposed substation**

Kaya Consulting Limited have been commissioned by Mainstream Renewable Power through Land Use Consultants to provide surface water hydrology and flood risk inputs to the Environmental Impact Assessment for the onshore works for the Neart na Gaoithe wind farm. A key component of the offshore works will be a substation located within the existing Crystal Rig wind farm in the Lammermuir Hills. The substation is not considered to be at significant risk of flooding, however, Mainstream have requested that a Flood Risk Statement is prepared for the site to support the EIA and to complement a drainage strategy document being prepared by others (Natural Power 2012).

**1. Site Description**

The proposed substation is located within the headwaters of the Tay Burn, adjacent to an existing substation used by the Crystal Rig Wind Farm. The site is in an upland setting to the north-east of Friardykes Dod (334 m AOD) and south-west of Watch Law (356 m AOD). Ground levels generally slope to the north-east, with the substation located at around 300 m AOD. The site is to be developed on open moorland with shallow peat. An existing man-made or man-influenced tributary of Tay Burn flows alongside an access track to the east of the proposed site.

**2. Flood Risk Assessment**

This assessment considers risk of flooding of the site from;

- Headwater tributary of Tay Burn.
- Surface runoff from adjacent land.
- Groundwater.
- Site Drainage System.

**2.1. Flood risk from headwater tributary of Tay Burn**

A headwater tributary of Tay Burn flows alongside the existing access track to the Crystal Rig Wind Farm. The stream may have originally been a natural water course; however, it is now a man-made drainage channel that parallels the access track, Photo 1, before crossing the track by way of a culvert.

The channel will follow the north-eastern boundary of the substation site for around 50 m before crossing under the access road. No works are proposed within the channel.

The catchment of the channel is no more than 15 ha. Based on the IH124 small catchments method the 1 in 200 year flow for this stream is estimated to be of the order of 330 l/s. The channel is around 1 m wide at the top of bank and 1 m deep (Photo 1). Based on a simple application of Manning's equation with bed slope of 1 in 100 (from available Ordnance Survey mapping) and Manning's n of 0.05, the channel is predicted to be able to pass the 200 year flow at a depth of less than 0.5 m, i.e., around 0.5 m below the bank level.

Ground levels within the substation are expected to be equivalent or slightly higher than the access road along its eastern boundary. In the case of blockage of the culvert under the access track water would be expected to back up and overtop the road rather than flooding onto the substation, given the general slope of land to the east.

Hence, the substation is not considered to be at significant risk of flooding from the tributary of Tay Burn.

**2.2. Flood risk from surface runoff from adjacent land**

A hillslope catchment lies upstream of the substation, with around 10 ha of slope draining towards the western boundary of the substation. The proposed site layout drawings show an embankment along the western boundary of the site which would divert upslope runoff away from the substation, around the edge of the site towards the tributary of Tay Burn. Potential flood risk from runoff from adjacent land has been considered by Natural Power (2012).

**2.3. Flood risk from ground water**

The substation is located in an area of peaty soils, such that there may be locally raised groundwater tables associated with poorly drainage soils. The proposed development will require lowering of land at the eastern edge of the site by up to 5 m (Natural Power, 2012). Hence, there is a risk of excavations exposing the groundwater table and resulting in groundwater flows into the excavated areas. This risk has been appreciated in Natural Power (2012), who propose the capture of subsurface flows along the edge of the development (including cut-off ditch at excavated slope), with flows routed towards the Tay Burn after attenuation.

**2.4. Site drainage**

As the site area is currently greenfield, development will increase runoff rates from the site area. Hence, the site drainage will need to be designed to limit surface runoff from the developed site to greenfield rates. A drainage strategy for the sub-station has been developed by Natural Power (2012)

which recommends attenuation of surface runoff to greenfield rates. Requirements for Sustainable Drainage Systems (SuDS) will need to be discussed and agreed with SEPA and the local council. However, if surface water runoff from the site is controlled to greenfield rates then the development should not increase flood risk to others downstream.

It is good practise to design the site so that so events in excess of the design storm for the site drainage system or in the event of blockage of the system that excess surface runoff can flow through the site without ponding or flooding properties or infrastructure.

### 3. Summary and Conclusions

The proposed development site is not considered to be a significant risk of flooding, assuming standard mitigation measures and good design practise.

If surface water runoff from the site is controlled to greenfield rates with appropriate SuDS measures in place, the development should not increase flood risk to others downstream.

### 4. Closure

We trust the above addresses your requirements at this stage. If you require further information or wish to discuss the above please do not hesitate to contact the undersigned.

Yours faithfully,

Michael Stewart  
Director

### Reference

Natural Power (2012). Neart na Gaoithe Offshore Wind Farm. Outlined Surface Water Drainage Strategy for Proposed Substation. Report for Mainstream Renewable Power, 6<sup>th</sup> August 2012.

**Photo 1: Headwater tributary of Tay Burn adjacent to proposed substation site. Measuring ruler in photograph is 1 m long.**





Figure 1: Location map for substation



