

Water Resource Assoc LLP

A network of consultants in hydrology, water resources and environmental issues

Please reply to:
Harvey Rodda

PO Box 838
Wallingford
Oxfordshire
OX10 9XA

Tel: +44 (0) 1491 838190
Mobile: +44 (0) 7971108980
Email: harvey@watres.com

Mr Jonathan Colchester
Chair Brecon and Radnor Branch
Campaign for the Protection of Rural Wales
Correspondence by E-mail

15th January 2019

Hendy Windfarm Development Hydrological Impacts

Dear Mr Colchester,

This letter provides a review of both the Environmental Statement (ES) submitted as part of the application to construct seven wind turbines at the Hendy Windfarm by Cunnane Town Planning dated 27th June 2014; and a review of the Surface Water Management Plan (SWMP) prepared by WYG Environment and Planning (Northern Ireland) Ltd dated 15th November 2018. The ES was submitted as part of the initial application and the SWMP was submitted in response to the conditions requested by the Local Planning Authority.

The review of both documents is specifically focussed on the impact of the development on the hydrology, and the proposed mitigation measures to be implemented. Background information on the development site was sourced through the use of Geographical Information Systems (GIS) and a visit to the area of the development on public rights of way was undertaken in January 2019. Water Resource Associates (WRA) have been providing consultancy in hydrology and water resources studies in the UK and overseas since 1994 and we have been involved in a number of planning Inquiries to provide expert advice on hydrological issues.

The ES includes a 42 page section on the hydrology and hydrogeology, and it states in the text that the section “...*should be read in conjunction with Technical Appendix 10.1.*”. It is understood that Technical Appendix 10.1 was not provided with the original ES submission and only made available as a rebuttal to the proof of evidence submitted by The Campaign for the Protection of Rural Wales during the Public Inquiry.

The critical evaluation of the ES and Technical Appendix was made with reference to particular criteria which have been used with previous WRA studies. The criteria aim to demonstrate the overall understanding of hydrology, the ability to use standard methods and software for hydrological analysis, and the particular issues for the site and the type of the development. These criteria are listed below and the assessment of the ES is given in Table 1 in relation to each criteria as either poor, moderate or good.

Partners

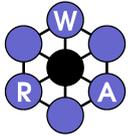
Frank A K Farquharson
Paul A C Holmes

Ronald E Manley
Dr Harvey J. E. Rodda
Professor Paul G Whitehead

Head Office:

PO Box 838
Wallingford
Oxon OX10 9XA

Tel: +44 (0) 1491 838190
E-mail: enquiries@watres.com



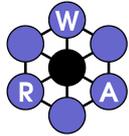
Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

1. Identify the catchment area where the wind farm/development is to be located;
2. Present details on the current catchment characteristics;
3. Present baseline flow and water quality for the catchment's receiving waters;
4. Consider the impacts on hydrology during the construction phase;
5. Consider the impacts on hydrology during the operational phase;
6. Quantify impacts either through modelling or monitoring;
7. Propose remedial measures to minimise the impacts;
8. Apply proper approved hydrological methods for the assessment.

Table 1. Assessment of the ES based on the 8 criteria

| Criteria | Assessment | Reasons |
|----------|------------|--|
| 1. | poor | The catchment area at the site is not identified, no maps are provided showing the catchment boundary |
| 2. | poor | Only the characteristics of the site, not the catchment are given in writing, but no maps are provided on the topography, geology, soil or landuse |
| 3. | poor | The nearest gauging stations are not identified, no observed flows or estimates of flows are presented; rainfall is given as a range in the average annual totals over the site; water quality is only described by repeating the Environment Agency classification. |
| 4. | good | Impacts during the construction phase on the development are discussed in detail |
| 5. | good | Impacts during the operational phase on the development are discussed in detail |
| 6. | poor | There is no modelling to provide estimates of quantities (e.g. kg of sediment) or proposed monitoring which can inform on the impacts of the development. |
| 7. | moderate | A large number of measures are proposed, however these are only described generally and no plans are presented showing how particular measures will be implemented at particular locations. |
| 8. | poor | The assessment made no use of any standard hydrological methods, such as obtaining data from the National River Flow Archive, presenting maps from NRW/EA, generating flows using the Flood Estimation Handbook ¹ , or the use of Geographical Information Systems (GIS). |



Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

The Technical Appendix for the ES is no more than a standard site report provided by a 3rd party for geological investigations. It makes no reference to the hydrology and the applicant or their agents do not provide any further comments on the information provided.

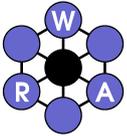
The local authority discharge of consent conditions (as provided in Annex A of the Cabinet Secretary's decision letter²) specifically requested the following under the topic of hydrology:

“No development shall commence until a Surface Water Management Plan containing details of the surface water drainage system (including a means of pollution control) has been submitted to and approved in writing by the Local Planning Authority. The plans must be implemented as approved unless otherwise agreed in writing by the Local Planning Authority.”

“No development shall commence until a water quality monitoring strategy (including monitoring at sources of private drinking water supplies) has been submitted to and approved in writing by the Local Planning Authority.”

Reports were submitted in November 2018 to meet these conditions. The SWMP includes a section on surface water quality monitoring, but a separate report for the water quality monitoring strategy was also submitted.

The location of the seven turbine sites are shown in Figure 1. A visit to the site on 11th January 2019 confirmed that the development is an upland area of steep to rolling topography with rough grazing, moorland and forestry, as shown in Figure 2. The area includes the upper reaches of the River Edw (Figure 3) and the Nant Brook - both tributaries of the River Wye which has been designated as a Special Area of Conservation. The visit also confirmed that work had begun on Turbine number 5, the most northerly of the sites which was viewed from the byway open to all traffic in Figure 4. This shows the extent of excavations at the site and the amount of bare soil which has been uncovered.



Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

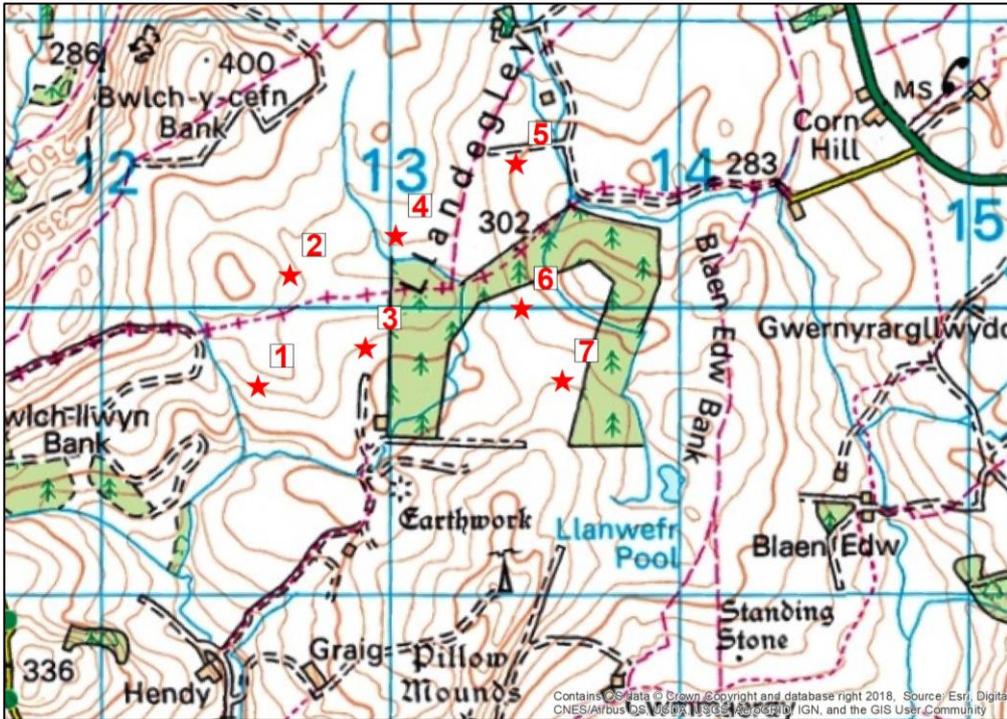
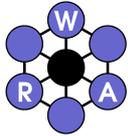


Figure 1. The wind turbine locations shown in red, background map OS 1:25,000 sheet 200.



Figure 2. View of the landscape of the development site.



Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

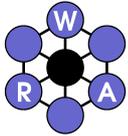


Figure 3. Headwater stream of the River Edw draining from the area of Turbine 5.



Figure 4. Site workings at turbine 5.

From this evidence the immediate concern would be the erosion of the exposed topsoil into the waterways and the impact on the increased sediment load further downstream into the River Wye. The ES stated that one of the mitigation measures would be “*scheduling construction activities to minimise the area and period of time that soil will be exposed, particularly during winter periods*”. Clearly as the work has started this particular mitigation has not been imposed.



Water Resource Associates

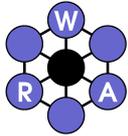
A network of consultants in hydrology, water resources and environmental issues

The SWMP does include more details on the mitigation measures which are required however it is still lacking in a lot of the basic information. No maps are provided showing the catchment area and the watercourses of the site, just a map showing the location of the proposed development and the location of water quality monitoring sites.

The mitigation measures should have included estimates of the design rainfall and associated flow for the headwater catchments using the Flood Estimation Handbook in accordance with the latest sustainable drainage system (SUDS) guidelines³. These would have included the estimate of the 100-year 6-hour duration rainfall and associated surface runoff to comply with the requirements of a surface water management plan. Culverts are proposed at road crossings, design flow estimates will also be needed in order to provide a proper sizing of the culverts, otherwise flooding of the access road would occur which could cause further contamination and potentially damage to the roads. Other models such as GLEAMS⁴ could be used to estimate the associated sediment loads which could be expected to be eroded in a worst case of the design rainfall during construction activities with the maximum area of exposed soil. This would allow for a proper design of the measures, simply implementing measures without an estimate of their capacity would have no ground for justification if a measure were to fail and cause contamination.

A proper consideration of mitigation features also needs to be included. It appears that much of the text describing mitigation in the SWMP is simply generic, and in many cases does not consider if these are appropriate for the type of the development and the setting within the landscape. For example, the use of swales is proposed for turbine bases, tracks, compound, sub-station and crane pad construction mitigation. Swales are described in detail in the current SUDS guidelines and are shallow ditches with a 1 in 4 side-slope which are included in designs not to convey water but to collect water from impermeable surfaces and allow the gradual infiltration into the soil/groundwater or loss through evapotranspiration. The swales are described as having a maximum depth of water as 0.3m. To comply with the 1 in 4 side slope each side of the swale would need to cover a distance of 1.2m. Assuming a base of 1m, the total width would need to be 3.4m. The excavation of a swale along side the type of access tracks in the steep to rolling topography of the wind turbine site, such as that shown in Figure 1, would not be possible.

Other methods such as the use of GIS to produce maps and perform spatial analysis should have been demonstrated. For example, a common mitigation method mentioned throughout the SWMP (and ES) is the limiting of any construction work where possible to areas outside buffer from each waterway. The ES used a 20m buffer but the SWMP suggested a 50m buffer. Neither report provided any maps indicating the extent of these buffers in relation to the development area. Such mapping is a relatively straightforward exercise using GIS software. An example of these buffers for the 4km area surrounding the development site is shown in Figure 5.



Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

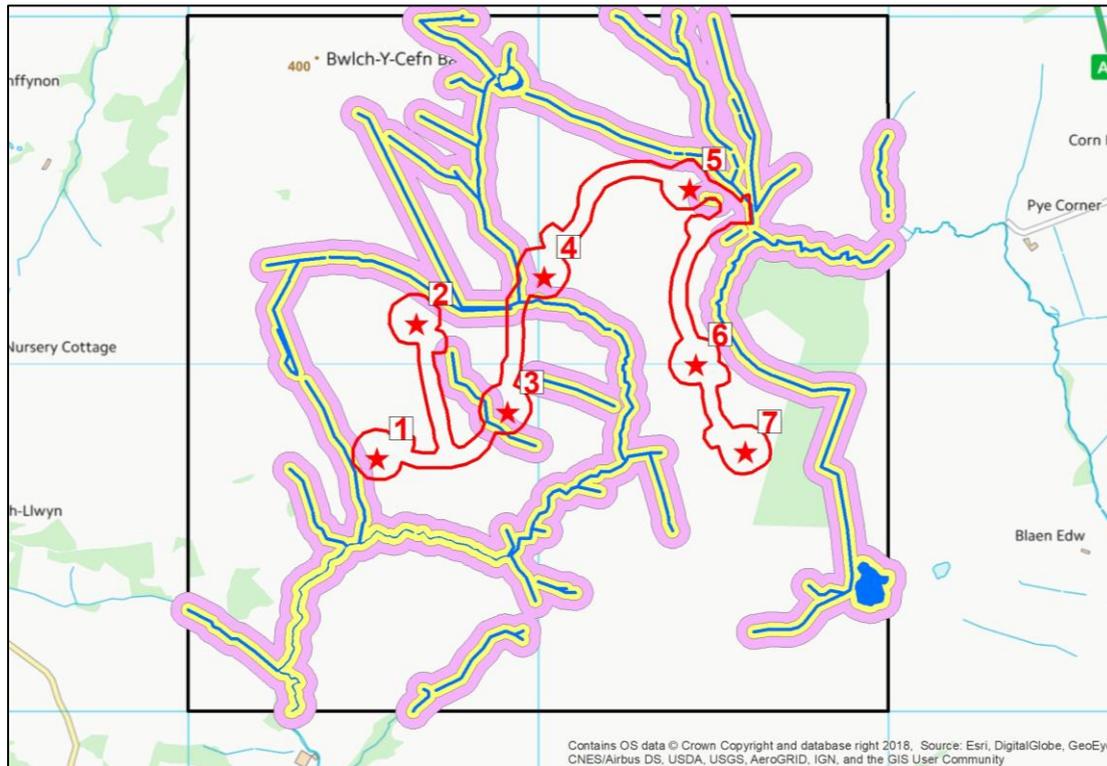


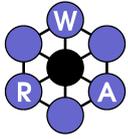
Figure 5. The 20m (yellow) and 50m (pink) buffer around waterways (blue) in the area of the wind turbine development site (red outline). Background map OS 1:10,000 open raster.

It is our opinion that both the ES and SWMP do not meet the requirements expected when considering the impact of the proposed development on the hydrology. There is no information on the catchment hydrology and no quantification of the potential impacts and no proper design of mitigation measures including a surface water management plan and monitoring of water sources. This letter has demonstrated our concern through visiting the site and observing the works which are currently being undertaken. It has also provided examples of the type of information which should have been included within the reports for mitigations measures. It is essential therefore that the proper level of information is submitted and approved by the Local Planning Authority prior to the continuation of works.

Yours sincerely,

Dr. Harvey J. E. Rodda *BSc., PhD., FRGS, Chartered Water and Environment Manager*
Partner

For and on behalf of Water Resource Associates



Water Resource Associates

A network of consultants in hydrology, water resources and environmental issues

References:

- ¹ Institute of Hydrology (1999). Flood Estimation Handbook, Wallingford, Oxfordshire.
- ² Cabinet Secretary for Energy, Planning and Rural Affairs Decision Letter Ref: qA1320857 25th October 2018.
- ³ Woods-Ballard, B., Wilson, S., Udale-Clark, H., Illman, S., Scott, T., Ashley, R., and Kellagher, R. 2015. The SuDS Manual. CIRIA Publication C753, London.
- ⁴ Knisel, W.G. 1993. GLEAMS – Groundwater Loading from Agricultural Management Systems, USDA, Tifton, Georgia, USA.