

# Wind farms and groundwater impacts

A guide to EIA and Planning considerations

Version 1.1 / April 2015

**PRACTICE GUIDE**



*'This good practice guide aims to assist applicants and planning authorities achieve a consistent approach when considering wind farm development management on ground water. Its correct application should help applicants and planning authorities identify and satisfy legislative requirements with regard to groundwater in wind farm development projects.'*

*This guide does not attempt to provide a detailed (account of the legislation and policy that underpin groundwater elements of wind farm developments in Northern Ireland and is not intended to be a source of legal advice. This guide is not intended to replace the need for judgement by planning officers and those making planning applications. Reference should always be made to the relevant legislation and if any discrepancy or conflict exists between the contents of this guide and the relevant legislation, the provisions of the legislation will prevail.*

*Further information can be obtained from the NIEA website [www.doeni.gov.uk/niea](http://www.doeni.gov.uk/niea). Links to external sources of information have also been provided in the text, where appropriate'.*

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## Introduction

This guidance document aims to help developers identify and mitigate against potential impacts on groundwater associated with wind turbine applications. It helps to inform those producing Environmental Impact Assessments in support of planning applications for proposed on-shore wind farm developments in Northern Ireland. This advice note is also intended to offer guidance to local planning authorities considering the associated potential environmental impacts of onshore wind farm applications.

The guidance covers the main areas and issues to be considered when assessing the potential impact on groundwater. It should not be used to replace existing detailed guidance that may exist. Guidance is given on the collection of baseline information, use of mitigation buffer zones, and reference of Pollution Prevention Guidance Notes.

### 1 Why is it important to protect groundwater?

Groundwater has three major uses in Northern Ireland:

- Abstractions for agricultural and industrial purposes, food and beverage production (including bottled water);
- Public and private drinking water supply; and
- Maintenance of flow and water levels in rivers, lakes and wetlands, particularly during times of low rainfall.

The protection of groundwater from the risk of possible contamination is important because pollutants could cause health problems in human beings, reduce the quality of agricultural products, make water unsuitable for certain industrial processes, and pose a threat to our countryside and environment including their suitability for recreational purposes. In summary, the contamination of groundwater can not only have health and environmental impacts, but also serious economic consequences.

## 2 What impact can a wind farm have on groundwater?

The development of a wind farm has the potential to impact on groundwater quality, groundwater quantity and/or the established groundwater flow regime. Figure 1 overleaf shows the scale and extent of the foundation of a single wind turbine which could potentially impact on the aquatic environment. Changes to the local water environment can affect receptors such as wells/boreholes, springs, wetlands and waterways, and can also have implications for groundwater dependent ecology and/or land stability.

The key impacts to groundwater that can result from the construction, operational and decommissioning stages of wind farms are summarised in Table 1 below.

**Table 1: Potential impacts on groundwater from wind farms**

	Construction Phase	Operational Phase	Decommissioning Phase
<b>Groundwater Flow Regime</b>	<b>Earthworks and site drainage:</b> <ul style="list-style-type: none"> <li>▪ Reduction in water table if dewatering is required for turbine foundation construction or borrow pits;</li> <li>▪ Changes to groundwater distribution and flow.</li> </ul>	<b>Physical presence of turbines and tracks:</b> <ul style="list-style-type: none"> <li>▪ Possible changes to groundwater distribution;</li> <li>▪ Reduction in groundwater storage.</li> </ul> <b>Reduction of forestry in site area:</b> <ul style="list-style-type: none"> <li>▪ Changes to infiltration and surface runoff patterns, thereby influencing groundwater flow and distribution.</li> </ul>	<b>Physical presence of former turbines and tracks:</b> <ul style="list-style-type: none"> <li>▪ Possible changes to groundwater distribution;</li> <li>▪ Reduction in groundwater storage.</li> </ul>
<b>Groundwater Quality</b>	<b>Earthworks:</b> <ul style="list-style-type: none"> <li>▪ Disturbance of contaminated soil and subsequent groundwater pollution.</li> </ul> <b>Materials Management:</b> <ul style="list-style-type: none"> <li>▪ Pollution from spills or leaks of fuel, oil and building materials.</li> </ul>	<b>Materials Management:</b> <ul style="list-style-type: none"> <li>▪ Pollution from spills or leaks of fuel or oil.</li> </ul>	<b>Use of vehicles and machinery to remove infrastructure:</b> <ul style="list-style-type: none"> <li>▪ Pollution from spills or leaks of fuel or oil.</li> </ul>

**Figure 1: Construction of the foundation of a single wind turbine.**



### 3 What does NIEA expect within an Environmental Impact Assessment in relation to groundwater for a wind farm application?

Within a wind farm Environmental Impact Assessment (EIA) NIEA will expect the following to be provided:

- Detail of the baseline conditions of the site, obtained from desk study and a field survey;
- Identification of potentially sensitive receptors (for example private drinking water supplies – see also ‘Undertaking a water features survey – guidance note’);
- Identification of potential impacts to groundwater from the development, and assessment of impact significance;
- Evidence of appropriate incorporation of mitigation buffer zones in the layout design; and
- Proposed mitigation measures in line with Pollution Prevention Guidance (PPG) Notes.

## 4 What data is collected for baseline conditions?

The degree of risk from the development is, in part, dependent on the sensitivity of local receptors. At a particular site, the local hydrogeological setting will influence the vulnerability of groundwater and associated receiving surface waters. For this reason it is important to establish local conditions prior to development, termed the baseline conditions.

The geology at the site will inform the hydrogeological setting, as well as other potential impacts; such as slope stability and peat slide issues. Information to be provided in the baseline should include:

- Quaternary (surface) geology and Bedrock geology mapping (provided by the Geological Survey of Northern Ireland (GSNI));
- Borehole log data if available (can be obtained from GSNI);
- The presence of peat to include data from a site walkover;
- Aquifer classification and vulnerability (can be obtained from GSNI GeoIndex); and
- The location of any proposed borrow pits and detail of their proposed restoration (as these may require dewatering) in addition to the proposed turbine and track layout.

A water features survey (to include a field survey) is required as it enables identification of the receptors that might be affected by the development both during and post-development. Guidance on undertaking water features surveys is provided in a separate NIEA Guidance Note. Early identification of sensitive receptors can be used beneficially to influence the design and construction of the wind farm to reduce potential risks.

The baseline conditions should also identify the potential for any existing contaminated or low quality groundwater at the site. The presence of these conditions at the site could affect the construction methods required (for example piling method or use of sulphate resistant concrete) or waste disposal required (for excavated soils or dewatered water disposal). An understanding of the historical setting of the site will determine if there is the potential for contaminated land or saline waters to be present.

The search radius for the baseline conditions will depend on the groundwater and surface water catchments likely to be affected.

## 5 Mitigation buffer zones

To reduce the risk of the wind farm development having an impact on the water environment the use of mitigation buffer zones should be considered in the layout design. Should elements of the development (tracks, foundations, borrow pits) be located within the buffer zones then further assessment (such as establishing the potential zone of contribution to the water feature) would be expected within the EIA to justify the expected impact significance.

Table 2 overleaf describes the mitigation buffer zone distances to be considered for potentially sensitive water features.

**Table 2: Buffer zones for water features**

Water Feature	Buffer Zone
Surface Watercourse	10 m (minimum detailed in PPG 5)
Water Feature <sup>1</sup> used for Drinking Water (public or private)	250 m
Water Feature <sup>1</sup> not used for water supply (but could provide a preferential flow pathway)	50 m
Designated Wetland	250 m

## 6 Mitigation measures

The presentation of mitigation measures for any wind farm development should make reference to the following Pollution Prevention Guidance Notes:

- PPG 1 – Understanding your environmental responsibilities;
- PPG 2 – Choosing and using oil storage tanks;
- PPG 5 – Works in, near or over watercourses;
- PPG 6 – Construction and demolition sites;
- PPG 13 – Vehicle washing and cleaning;
- PPG 21 – Pollution incident response planning;
- PPG 22 – Incident response – dealing with spills; and
- PPG 26 – Storing and handling drums and intermediate bulk containers.

The current PPG versions are found at:

[http://www.netregs.org.uk/library\\_of\\_topics/pollution\\_prevention\\_guides.aspx](http://www.netregs.org.uk/library_of_topics/pollution_prevention_guides.aspx)

Water quality and flow monitoring prior to development to provide a qualitative and quantitative baseline might be required. In addition should an impact on a water supply feature be identified as significant then appropriate remediation measure(s) must be identified by the applicant. For example, in the case of a private water supply mitigation against deterioration in either the quality and/or the sufficiency of the supply should be considered.

<sup>1</sup> surface watercourse, spring, well, borehole

## 7 Information sources and further guidance

### **Geological Survey of Northern Ireland**

**Tel:** 028 90388462

**Website:** [www.bgs.ac.uk/gsni/](http://www.bgs.ac.uk/gsni/)

**Email:** [gsni@detini.gov.uk](mailto:gsni@detini.gov.uk)

GeoIndex, geological maps, reports and memoirs, borehole and site investigation reports

### **SpatialNI**

**Website:** [www.spatialni.gov.uk/geoportal/catalog/main/home.page](http://www.spatialni.gov.uk/geoportal/catalog/main/home.page)

**Environment Agency**, May 2002. 17 Scoping the environmental impacts of windfarms (on-shore and off-shore).

### **Drinking Water Inspectorate**

**Tel:** 028 90569282

**Website:** [www.doeni.gov.uk/niea/water-home/drinking\\_water.htm](http://www.doeni.gov.uk/niea/water-home/drinking_water.htm)

**Email:** [dwi@doeni.gov.uk](mailto:dwi@doeni.gov.uk)

For further information in relation to private water supplies



# DOE

Department of  
the Environment  
[www.doeni.gov.uk](http://www.doeni.gov.uk)

## **NIEA Waste Management Unit**

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