

Arboricultural Implications Assessment

For

The Onshore Cable Route for Neart na Gaoithe Offshore Windfarm

Under instruction from:

Mainstream Renewable Power

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SUMMARY

When installing the underground cables on land to service the offshore wind farm it will be necessary to route the cables past several groups of mature trees and ancient woodland sites. Precautions will be taken to minimise damage to tree root systems during installation works wherever trees are present.

It's proposed that a trenchless technique will be used to provide a route for the cables required as they cross the root protection areas of retained trees or woodland. This will be a methodology that avoids disturbing the parts of the soil where tree roots are likely to be growing. The pits for starting and receiving the drilling machinery shall be located outside of the root protection areas required by adjacent trees. Any bore shall be made at a minimum depth of 60cm below ground level so that tree roots are avoided but under this proposal we expect the cables to be installed at approximately 1.1m beneath the soil surface and so this should be well below the layers of soil occupied by tree roots.

All trees and ancient woodland adjacent to the onshore works will be protected using temporary fencing. If an arboriculturist is present when the fencing is being installed then the separation distance can be calculated using the methodology detailed in BS5837:2012 but if there is no-one familiar with this methodology present on site when the location of the fencing is marked out then I advise that the method described by NJUG 4 is used: This requires a separation distance of four times the circumference of the trunk. A piece of string should be wrapped around the tree at a height of 1.5m and once this length has been marked the separation distance can be worked out by placing this length on the ground four times in a direct line away from the trunk. This measurement will identify the extent of the tree protection zone this will be required and appropriate fencing should be installed to protect this ground. It's crucial that the temporary fencing is installed before any ground works commence.

An arboriculturist will be employed to supervise excavation works near trees and advise on any other site-specific tree protection measures. Access for site staff and construction machinery must be on planned routes only. These routes must either be outside of the root protection areas of trees and woodland or on established tracks or footpaths so that disturbance of trees and woodland is avoided.

An arboricultural method statement for the construction works has been produced as a separate document. This document details the way in which the ground works must be carried out. If this arboricultural method statement is followed then there will be minimal impacts on the roots of adjacent trees.

The site manager should be made aware of the tree protection requirements at the site and provided with a copy of this report and the arboricultural method statement; this information must be passed on to all construction staff.

1 INTRODUCTION

1.1 Background Information

A new offshore wind farm is proposed near Dunbar in Scotland. New electricity cables will need to be installed onshore to service this facility. The proposed route passes three narrow strips of woodland that are on the Ancient Woodland Inventory.

Documents provided to Bosky Trees:

- Map showing cable route - LUC 6/12/2011.

1.2 The Assignment

I was instructed by Mainstream Renewable Power to produce a method statement for directional drilling works near ancient woodlands and specify suitable tree protection measures. The following information is provided in this report to accompany their planning application:

- Arboricultural Impact Assessment – An assessment that identifies, evaluates and possibly mitigates the extent of direct and indirect impacts on existing trees that may arise as a result of the implementation of the proposed development.
- Arboricultural Method Statement – A document detailing any special methods that should be used in order to minimise the impact of construction operations on existing trees.

1.3 Limitations

This assessment is a desk study and so is based on information provided.

2 ARBORICULTURAL IMPACT ASSESSMENT AND PROPOSED MITIGATION

2.1 Summary of Potential Impacts on Trees

If roots are damaged close to the trunk the anchorage and stability of the tree may be adversely affected rendering the tree immediately at risk of collapse. If roots are damaged anywhere along their length the distal portion (including the fine roots they serve), will be destroyed. Damage to fine roots by severance of a main root will prevent fine roots from absorbing the water and nutrients which are essential for the well-being, growth and anchorage of the tree.

Above ground trees have a single or multi-stemmed trunk supporting a framework of branches and twigs. These structures are protected by a layer of bark, the purpose of which is to protect the functional tissues immediately beneath.

Trees can be damaged by:

- Direct impact by plant or machinery
- Fire and scorching
- Poor pruning
- Abrasion by overhead apparatus
- Chemicals and fuel oils
- Storage of materials on ground above rooting areas

Soil compaction quickly occurs if vehicles pass over an area of soil. Compaction may cause reduced infiltration rates of water, poor drainage, reduced availability of water, and reduced air and oxygen supply to roots leading to reduced root growth and, as a result, the growth of woody plants is inhibited.

2.2 Methods to Mitigate the Impacts of Works

Installation of drainage or other underground services by typical 'open trench' methods near trees is likely to sever roots; this will harm the physiological condition of the tree, provide an opportunity for fungal infection and may also leave a tree prone to windthrow. For these reasons it's proposed that a trenchless technique will be used to provide a route for the cables required as they cross the root protection area (RPA¹) of retained trees or areas of ancient woodland. This is a methodology that avoids disturbing the parts of the soil where tree roots are likely to be growing.

The inherently variable nature of trees and natural soils makes it impossible to know exactly where tree roots will be growing at a particular site. The quantity of roots decreases rapidly with increasing depth in normal soils because at lower soil depths there is increasing resistance to root penetration (hardness) and essential resources such as oxygen and soil pore space become scarce. Major roots and their primary branches are woody and perennial; in typical clay-loam soils these are usually located less than 20–30cm below the soil surface² but finer roots will proliferate into lower soil levels. Under normal conditions most tree roots are found in the upper 60cm of the soil profile³. If works are carried out beneath 60cm then impacts on tree roots is likely to be minimal⁴. Under this proposal we expect the cables to be installed at approximately 1.1m beneath the soil surface and so this should be well below the layers of soil occupied by tree roots.

The above ground separation distances afforded to individual trees will be in accordance with BS5837:2012⁵ - Trees in relation to design, demolition and construction - Recommendations. As such the stem diameter will be used to calculate the RPA required by each tree during construction and these areas will be protected by temporary fencing during construction (see section 2.3).

If an arboriculturist is present when the fencing is being installed then the separation distance can be calculated using the methodology detailed in BS5837:2012 but if there is no-one familiar with this methodology present on site when the location of the fencing is marked out then I advise that the method described by NJUG 4 is used: This requires a separation distance of four times the circumference of the trunk. A piece of string should be wrapped around the tree at a height of 1.5m, once this length has been marked the separation distance can be worked out by placing this

¹ The root protection area (RPA) is a layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of roots and soil structure is treated as a priority.

² Perry (1982). Tree Roots. Journal of Arboriculture 8 (8). 197-211.

³ Arboricultural Association (1991). Tree Roots. Arboricultural Association leaflet number 6.

⁴ NJUG (2007): Guidelines for the Planning, Installation, and Maintenance of Utility apparatus in the Proximity to Trees. National Joint Utilities Group Volume 4.

⁵ British Standards Institution (2012). BS5837 Trees in relation to design, demolition and construction – Recommendations. BSI, London.

length on the ground four times in a direct line away from the trunk. This measurement will identify the extent of the tree protection zone this will be required and appropriate fencing should be installed to protect this ground.

To ensure that soil compaction is avoided, it's very important that no vehicles pass over the root protection areas during construction and once the fencing has been taken down. Therefore access routes for site staff and construction machinery must be either outside woodland or on established transit routes (tracks or footpaths) so that disturbance of trees and woodland is avoided.

2.3 Tree Protection Fencing

All trees which are being retained on the site should be protected by temporary fencing, barriers and/or ground protection. The location of necessary tree protection is indicated on the tree protection plan at the front of the report (TPP-1). **For effective tree protection it is crucial that the temporary fencing is installed prior to any plant machinery entering the site and before any development or ground works commence.** It should be confirmed by the project arboriculturist that the fencing and ground protection have been correctly set out on site, prior to the commencement of any other operations. The tree protection measures are to remain in place until the construction works have been completed. The fenced off area will be a construction exclusion zone.

Fencing (or other forms of barrier) must be fit for the purpose of excluding construction activity and appropriate to the degree and proximity of work taking place around the retained tree(s). In most cases fencing should consist of a scaffold framework comprising a vertical and horizontal framework, well braced to resist impacts, with vertical tubes spaced at a maximum interval of 3m. A specification for fencing suitable for most construction sites is provided in Figure 2 of BS5837 but in some situations more light-weight stabilizing systems for fencing may be sufficient, this is detailed in Figure 3a and 3b in BS5837. Alternative methods of barrier could be appropriate for tree protection provided that they are sufficient to exclude construction activity; but any such methods must first be agreed by the Local Authority's arboricultural officer.

Once the barriers have been erected the areas of land within the construction exclusion zone should be regarded as sacrosanct, and should not be removed or altered without prior consultation with the project arboriculturist and, where necessary, approval from the local planning authority. All-weather notices should be attached to the fencing with words such as: "Construction Exclusion Zone - No Access". Throughout the construction period attention should be paid to ensure that barriers remain rigid and complete.

2.4 General Specification for Effective Tree Protection

The site manager should be made aware of the tree protection requirements at the site and the guidance provided in this report.

All construction staff should be made aware of the following restrictions that apply to construction exclusion zones:

- During construction no protective fencing is to be moved or dismantled without written permission from an arboriculturist.

- Movement of heavy mechanical plant (excavators etc.) must not be undertaken within the RPAs of trees, except on existing hard surfaces, in order to prevent unnecessary compaction of the soil.
- Spoil or any other materials must not be stored within tree RPAs.
- Care must be taken when planning site operations to ensure that wide or tall loads, or plant with booms, jibs and counterweights can operate without coming into contact with retained trees.
- Potential contaminants such as diesel oil, cement and bitumen must be stored at least 10m from any trees, with provision made for any spillage or run off to be contained away from protected areas.
- Don't attach any signs or hoardings to tree trunks.
- No fires should be permitted on site.
- If the trunk or branches of a tree are damaged in any way advice should be sought from the local authority tree officer/arboriculturist.

3 POTENTIAL DAMAGE OF THE INSTALLED CABLES BY TREES

Underground apparatus (especially those less than 60cm deep) may be affected by tree roots. The risk will depend on the ability of the apparatus, in particular any joints, to resist or tolerate distortion.

Direct damage is caused by the annual increase in root thickness resulting in eventual contact with installed cables. However, it is usually either the root or the adjacent soil that will distort rather than the apparatus itself. The potential for damage depends on how much the root thickens and is greatest in the main structural roots within 3 metres of the tree. Roots may grow around an apparatus to form a sheath but this will rarely exert sufficient pressure to cause any damage. Surface wrappings inadequately attached to an apparatus, if non-toxic, may be colonised by roots and eventually lifted off.

Indirect damage is restricted to shrinkable soils, mainly clays but also peat and some silts. Such soils shrink as they dry with the potential to distort any apparatus supported by the soil. Vegetation growing within the same area of soil may increase the drying effect.

Intact apparatus will not generally be penetrated by roots. However roots can exploit existing defects such as defective pipe joints or inadequate/degraded pointing of inspection chambers. Where internal conditions are moist and aerated and therefore most conducive to root growth, root proliferation may occur.

The potential for damage to apparatus close to a tree may increase due to movement of the lower trunk and a structural root as the tree sways in strong winds. Such movement may result in direct pressure being applied to the apparatus. Furthermore, if a tree is uprooted, any apparatus passing

across or through the disturbed root plate may also be displaced. Such events are unlikely and are restricted to situations where apparatus is in close proximity to the trunk of the tree, but the potential may be increased if other structural roots are severed.

4 RECOMMENDATIONS

4.1 The Recommended Approach

When planning the installation of underground cables near groups of mature trees or woodland sites the position of existing trees should be considered as one of the primary factors which could affect the siting, depth, method of installation, and future maintenance of that apparatus.

Wherever trees and woodland are growing adjacent to the onshore works, precautions should be taken to minimise damage to their root systems. An arboriculturist should be employed to identify where tree protection fencing will be installed and advise on site specific tree protection measures.

It's proposed that a trenchless technique is used to provide a route for the cables required for the new wind-turbine facility as they cross the RPAs of retained trees or woodland. This would be a methodology that avoids disturbing the parts of the soil where tree roots are likely to be growing. The bore should be made at a minimum depth of 60cm below ground level.

All trees and woodland near the onshore works will be protected using temporary fencing. The location of the fencing will be calculated using either of the methods detailed in BS5837:2012 or NJUG4. The pits for starting and receiving the drilling machinery should be located outside of the RPAs of all trees.

Access for site staff and construction machinery must be on planned routes only. These routes must either be outside of the RPAs of trees and woodland or on established tracks or footpaths so that disturbance of trees and woodland is avoided.

Apparatus laid in clay or peat should be constructed to tolerate movements of the subsoil caused by root activity.

If contractors need any advice on tree protection measures during the course of the project they should contact Bosky Trees on 01373 832778 or info@boskytrees.co.uk.

4.2 Work According to an Arboricultural Method Statement

An arboricultural method statement for the construction works has been produced as a separate 'stand-alone' document. This document details the way in which the ground works must be carried out. If this arboricultural method statement is followed then I expect that there will be minimal impacts on the roots of adjacent trees.