Appendix 13-1 Forestry Report

EIAR – Volume 3

Knockanarragh Wind Farm

SLR Project No.: 501.V00727.00008

25/01/2024

Contents

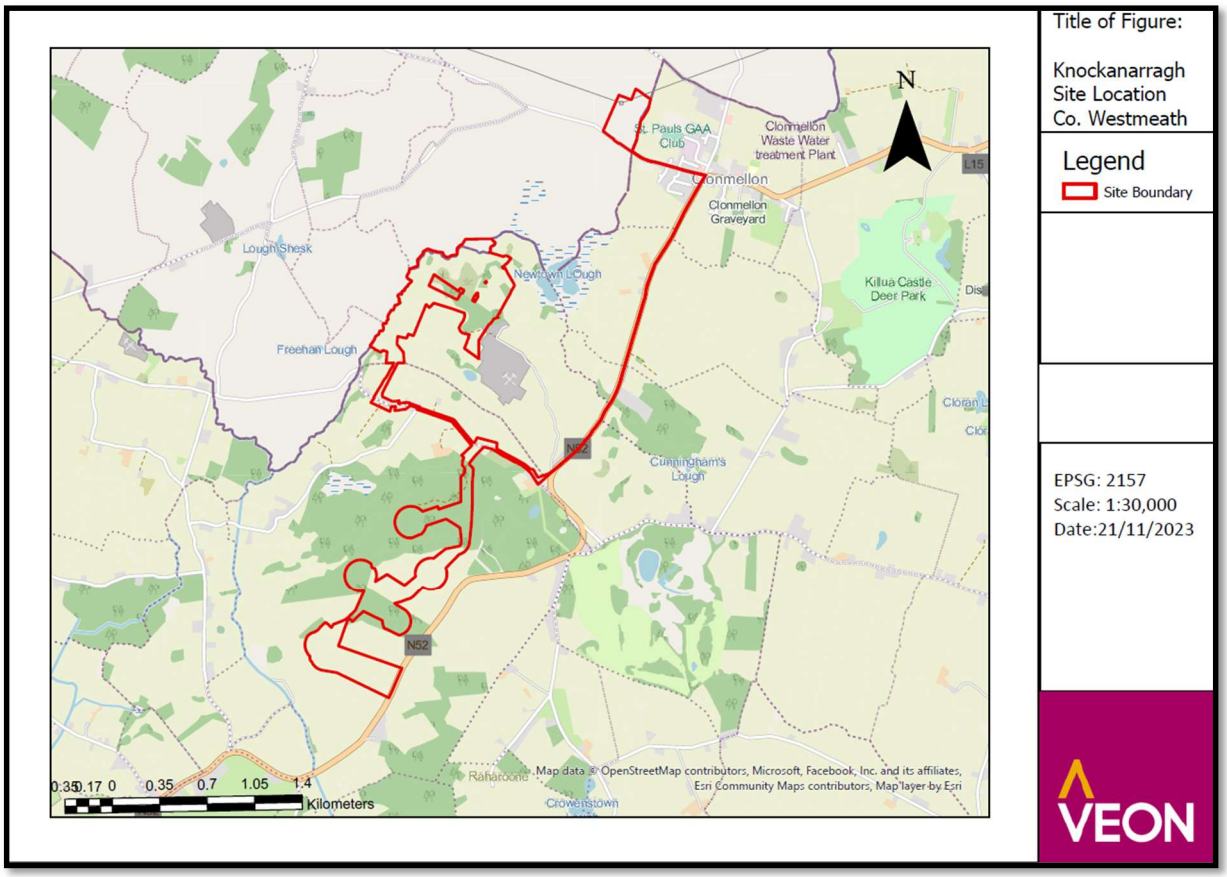
Definition of Terms

- **Afforestation**
  The establishment of a forest in areas where the preceding vegetation or land use was not forest.
- **Buffer Zones**
  An effective buffer zone is an area where forest operations are curtailed and which is managed for environmental protection and enhancement. Regarding watercourses, within the required aquatic buffer zone (see the Forestry & Water Quality Guidelines).
- **Clear-felling**
  Clear-felling should be viewed here as the final stage in the forestry crop cycle, where an entire standing crop of trees is removed from an. area or harvested (also called clear-cutting, clearfell logging, clearcut logging).
- **Coup**
  A small area of forest within a compartment that is harvested in a single operation.
- **Eutrophication**
  A process where a high concentration of nutrients has been introduced into a watercourse which promotes an excessive growth of algae which can deplete oxygen levels in the water and deleteriously affect aquatic life.
- **Hectare**
  A unit of land area equal to 10,000 square metres, or 2.4711 acres.
- **Infrastructural felling**
  Trees permanently removed to facilitate construction of the infrastructure for a wind farm development.
- **Mound Drains**
  It involves an excavator digging drains at regular intervals and heaping the soil in mounds. The trees are then planted into the mounds which provides an elevated vegetation free zone.
- **Plantation**
  A forest or tree crop established by the manual planting of saplings or seedlings.
- **Rotation**
  The period of years required to establish and grow a timber crop to a specified condition of maturity, when it may be harvested, and a new tree crop started.
- **Stand**
  An aggregation of trees occupying a specific area and uniform enough in composition (species), age and arrangement to be distinguishable from the forest on adjoining areas and considered a homogenous unit for management purposes.
- **Thinning**
  A partial cut in an immature forest of overstocked tree stands used to increase the remaining stand's value by growth and value by concentrating on individual trees remaining with the best potential to reach clearfell.
- **Top height**
  The average height of the 100 trees with the largest diameter at breast height (DBH) at the time of measurement.
- **Turbulence Felling**
  The removal of trees proximate to wind turbines to preclude air turbulence that would otherwise be created by the forest canopy.
- **Windblow**
  The uprooting of trees by wind.
- **Windsnap**
  The breakage of tree trunks (or boles) by wind force.
- **Yield Class (YC)**
  This is defined as the potential growth rate or yield of a forest, expressed as cubic meter per hectare per year. The higher the YC the quicker the forest is growing.

Forest Overview

Forest Location

The forest is located approximately 4 km northeast of Delvin, County Westmeath. There are numerous county and forest roads accessing the forests in this study area. Forest barriers/gates are present at most access points. The geographic location presents good access to the harvesting network of timber buyers nationwide being only 15 minutes from the M3 motorway.



Map 1 illustrates the location of the site.

Forest Description

The proposed site contains approximately 79.11 ha of forestry. The majority of which would be classed as commercial forestry, with a high percentage also having very good growth rates (yield class) and having good quality timber. The maps below illustrate the locations of all forestry growing within the proposed site layout. All the forestry within the study area is privately-owned.

The paragraphs below will detail and illustrate the woodland present where the development proposes turbine locations. The potential impacts and mitigation measures are dealt with later in the report.

Map 2 illustrates the forestry plots located within the study area; it also illustrates the approximate location of the turbines in relation to the existing forestry.

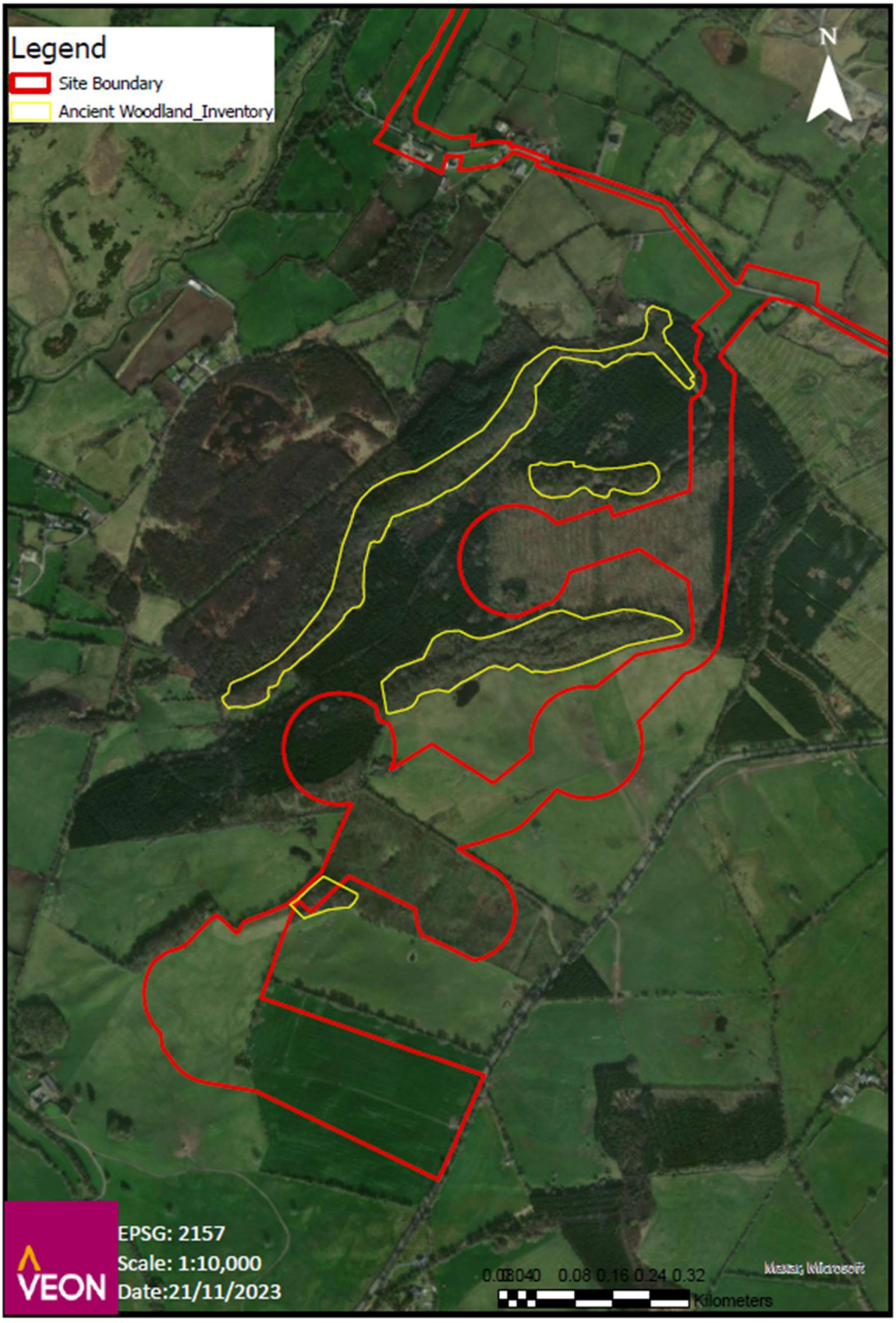
The proposed windfarm infrastructure and associated buffer areas affects forestry at five of the eight turbine locations. Access roads and other infrastructure also cut through some of these plots. A summary of the affected forestry is presented in the table below.

Relevant Infrastructure	Forestry Plot	Tree Species Present:	Planting Year	Yield Class	Estimated Felling Year	Seimans felling area (ha)	Vestas felling area (ha)
T1	22	Birch and Additional broadleaf species (AdB)	C. 1998	4	N/A	0.24	0.30
T3	24	Birch and Additional broadleaf species	C. 1998	4	N/A	3.03	3.07
T4	8 + 5	Sycamore & AdB & Norway Spruce	1996 1995	8 22	2070 2035	3.79	3.98
T5	5, 7 + 25	Norway Spruce & Sycamore & Scots pine & Sycamore	1995 (all)	22 6 8	2035 2070 2070	3.50	3.62
T7	1	Sitka spruce and AdB	2023	24	2051	3.10	3.27
Other associated infrastructure	Multiple	Multiple	1995	N/A	Multiple	5.97	5.84
					Total Area (ha):	19.62	20.09

The forestry within the affected areas is mixed in relation to timber quality. The majority of the affected forestry is of good quality with high yield class productivity and will likely produce a high-quality timber product at the end of the rotation.

As illustrated in map 3 below, the site also contains some possible ancient and long-established woodland habitats. These would be classed as non-annex woodland with a mixture of Oak-Ash-Hazel woodland and (mixed) broadleaved woodland. The proposed location for turbine T5 is proximate to some of this woodland, though no (potentially) ancient trees will be removed during its development and a 20-metre operational buffer area will be implemented from the woodland edge.

Possible ancient woodland also exists between the turbine locations for T7 and T8. However, access to T8 approaches from the south and does not interact with this woodland. Furthermore, an internal cable connection from T8 runs north towards the other turbines - this cable will run underground outside of the possible ancient woodland area, with no tree clearance or felling required.



Map 3 illustrates the possible ancient and long-established woodlands within the study area.

Photo 1 illustrates the southern section of plot 1 where T7 is located. Ash trees have recently been clear-felled here and the plot has now been replanted with Sitka spruce and additional broadleaves around the edges. Photo 2 illustrates a good road network running along the south-eastern edge of the plot.

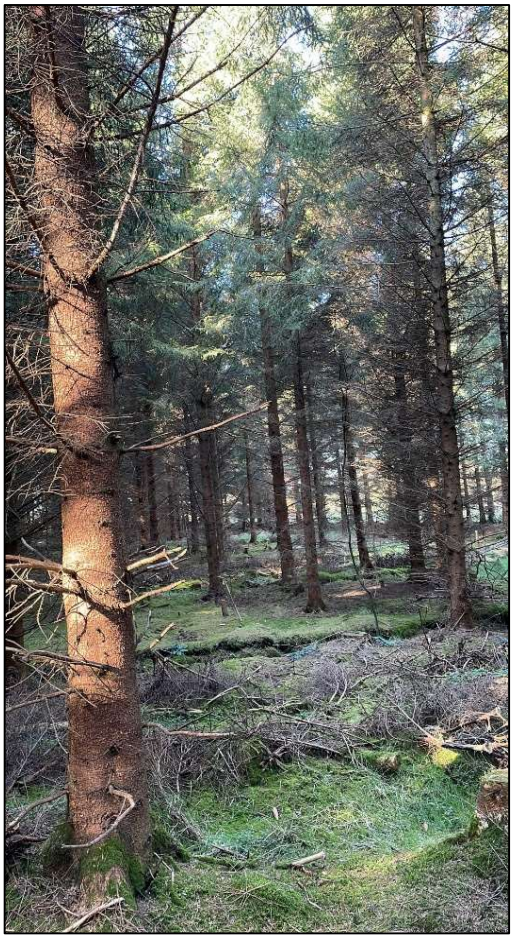
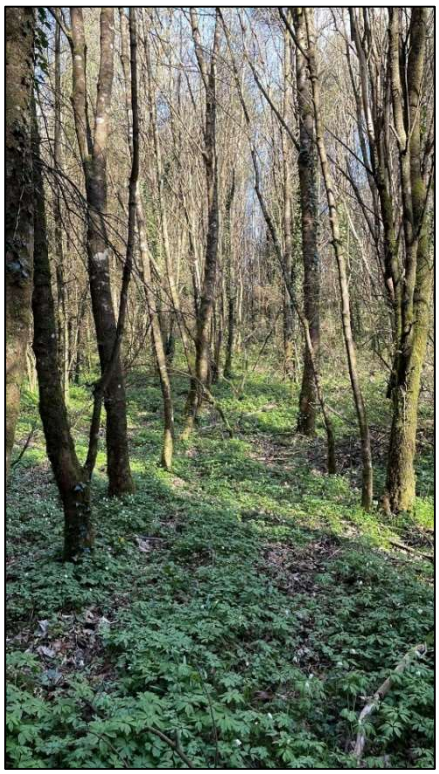


Photo 3 illustrates high-quality commercial Norway spruce forestry that has been thinned twice to date. Photo 4 illustrates evidence of windsnap within the plot following thinning.

Photos 5 and 6 illustrate the approximate location of T5 with a dry ditch evident in photo 5. This area lies outside the edge of the nearby possible ancient woodland (photo 6).



Photos 7 and 8 illustrate a mixed species woodland in plot 7 just north of the T5 location. This area has not been harvested and has a mix of native species such as oak and Scots pine.

Photo 9 illustrates the possible ancient woodland located in plot 6, with photo 10 illustrating the boundary running between plot 5 and the woodland in plot 6 (between T4 and T5).

Photo 11 illustrates some of the outstanding beech trees located within and on the east side of plot 5, adjoining plot 6. This area lies outside the buffer zone to the west of T4. No damage to trees of this nature will occur as a result of the Proposed Development.

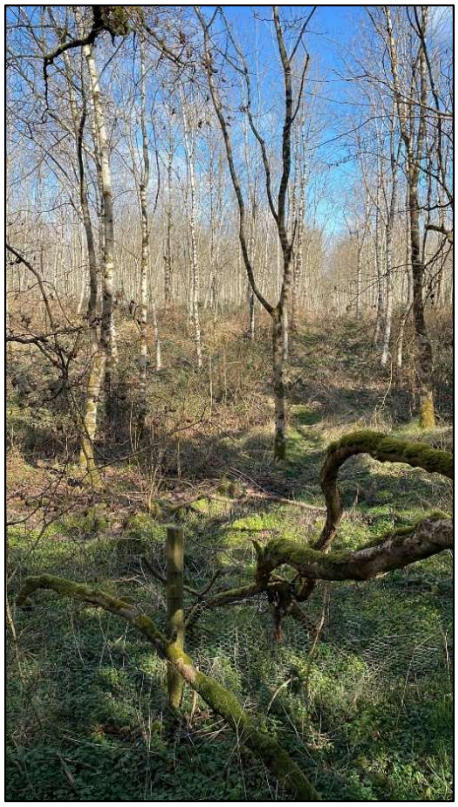


Photo 12 illustrates the location of T4 within plot 8 looking north: this plot consists of pure sycamore and some additional broadleaves and has been thinned twice to date. Photo 13 illustrates a soakage area to the west of T4 within plot 8.

Photo 14 illustrates (mostly) hazel coppice wood located within the possible ancient woodland in plot 6. Photo 15 highlights evidence of badger (*Meles meles*) presence at this location.

As illustrated on map 3 on page 8, there are possible ancient woodlands to the north and south and in the centre of the development area. These potential ancient woodland areas comprise of beech, birch, hazel, oak and ash trees: no disturbance will occur in these woodlands for the development of project infrastructure. These areas are illustrated in the photos below.


Photos 17 and 18 illustrate the possible ancient woodland running along the northern and southern edge of plot 2 - to the east of plot 10.



Photos 19–22 illustrate the possible ancient woodland that runs along the northern boundary of plot 5 and within plots 18, 19, 20 and 21. This woodland will be left undisturbed during all proposed construction works.

Photos 23 and 24 illustrate the forestry present in plot 22. This forestry is very poor from a commercial standpoint, with poor drainage noted at this location. These areas will not be thinned or ever be used for commercial forestry.

Photo 26 illustrates the location of T3, which will be sited to the south of poor native birch woodland with limited drainage due to underlying peat soil within plot 24.

Forest Certification

All of the forests impacted by this wind farm development are privately-owned and are not currently being managed under forest certification.

Timber Harvesting

The felling (or harvesting) of trees typically involves the cutting of trees and the extraction of felled timber to the roadside, which generally occurs during thinning or clear-felling operations. For independency the following information about harvesting is taken from the national forestry advisors Teagasc (https://www.teagasc.ie/crops/forestry/advice/timber-harvesting/) and Forestry Focus websites (https://www.forestryfocus.ie/growing-forests-3/) .

Harvesting Types

i). Thinning describes the removal of inferior trees to increase the quality and size of the remaining stems. It is generally undertaken two to five times over a forest rotation. In conifer stands, first thinning usually involves the removal of lines of trees within the crop as well as the selection and removal of inferior trees in between lines. This provides access for subsequent selective thinning. Thinning in broadleaf forests involve the periodic selective removal of competing trees to favour the higher-quality stems.

ii). Clear-felling describes the harvesting of all marketable trees at the end of a forest rotation, and generally occurs when trees are aged between 30-50 in coniferous forests and later for broadleaves.

iii). Continuous Cover Forestry is an alternative approach to clear-felling where some trees are periodically removed but a canopy is continually maintained.

Harvesting Operations

Harvesting operations typically involve the felling of selected trees, the removal of branches, cross-cutting of stems into size categories, stacking along tracks in the forest and extraction to roadside.

Felling of Timber

Most timber felling today involves the use of specialised harvesting heads, either fitted to standard excavators or purpose-built harvesters – the latter is illustrated in photo 27 below. These machines comprise a base machine with a harvesting head mounted onto a hydraulic arm. Harvesters are often modified low-ground pressure machines, capable of working across multiple site conditions, and can be fitted with tyres, tracks or chains as demanded by a given site to protect the soil. The operator controls the movement of the machine from the cab and an onboard computer system can be programmed to cut felled trees to a size and length specified by the customer. The harvester will process trees down to 7 cm, and the remainder of the tree and branchwood will be placed on the track (or rack) in front of the harvester to serve as a brash mat for the harvester and forwarder to travel on, minimising soil disturbance.

The processed logs are placed on the side of the rack where the forwarder can access them as it trails the harvester. The harvester also threats the cut stump as it cuts the log with urea, preventing butt rot disease (*Heterobasidion annosum*) in the future. This will be a condition of a felling licence unless the trees are within an aquatic buffer zone.

Extraction of Timber

Specialised forwarding machines (as illustrated in photo 28 below) are currently the most common timber extraction method used in Irish forestry. A forwarder has a similar base machine to the mechanical harvester but has a powered trailer fitted with a hydraulic grapple arm to load felled timber. Forwarders can be fitted with tracks or chains (depending on soil conditions) and can typically remove 9-12 tonnes of timber per journey. A forwarder typically follows the harvesting machine to collect and extract timber to the roadside.

Environmental Considerations

Harvesting—of all forest operations—has the most potential to negatively impact the forest environment. Guidelines, as detailed below in the mitigation section, have been developed by the Forest Service to ensure best practice during harvesting operations and to protect waterways, soils, wildlife, ancient heritage sites and the wider local landscape.

Harvesters and forwarders are also typically designed to minimise soil damage - these are fitted with large soft tyres which spread the machine weight over a wide area. In addition, the standard practice sees the placing of branchwood from the felled trees under the wheels or tracks of the harvester to form a thick carpet of protective foliage which supports the machines and reduces the risk of soil compaction and rutting. Harvesting operations are also generally scheduled according to the nature of the soil, with sites being categorised into winter and summer sites depending on ground conditions. Best practice requires the suspension of mechanised harvesting operations during and immediately after periods of particularly heavy rainfall.

Waterways are particularly vulnerable to the effects of harvesting as silt from machinery movement can enter streams or rivers causing blockages which can affect aquatic insect and fish life. Additionally, nutrients released from decaying branches, particularly from large, clear-felled sites, can cause enrichment of the water and give rise to eutrophication. To counteract these effects careful planning is required in carrying out harvesting operations. Mitigative measures are outlined later in this report

The noise and impact of harvesting operations can also have a major impact on wildlife. Therefore in planning felling operations care must be taken to ensure that important wildlife habitats are identified, retained and protected. Due regard must be given to the breeding and nesting seasons of important species (and associated features such as badger setts and heronries). For instance, to minimise impacts on bird species, the timing of harvesting may be delayed until after the nesting season concludes.

The effects of clear-felling can also have a significant impact on the landscape unless carefully carried out. In Ireland, afforestation has resulted in many adjacent conifer plantations being established within a 2–3-year period creating a large uniform area of forest which require harvesting at the same time. Foresters are now re-structuring these forests to create greater diversity in the next rotation. The phased felling of small felling coupes and replanting with more diverse species will, over time, reduce the visual and environmental impacts and ensure that succeeding rotations do not inherit the same undesirable structure. Staggered felling/reforestation also benefits biodiversity and the landscape by introducing structural and age diversity.

Potential Impacts

The Impact of Trees on Wind Turbines

The presence of trees has a number of effects on wind turbine performance. As trees sway in the wind, it indicates that they are absorbing energy from the wind, energy that would otherwise be available for turbine operation.

Where wind turbines are sited in mature forestry and where the canopy is closed, the canopy height creates a false ground level that effectively reduces the hub height of the turbine by the height of the trees. There is a consequent reduction in energy yield.

The above effect is compounded by the fact that the surface of the tree canopy is not smooth or uniform, leading to increased roughness. The result of this is a thicker boundary layer of disturbed airflow over the canopy than would otherwise occur over more open ground.

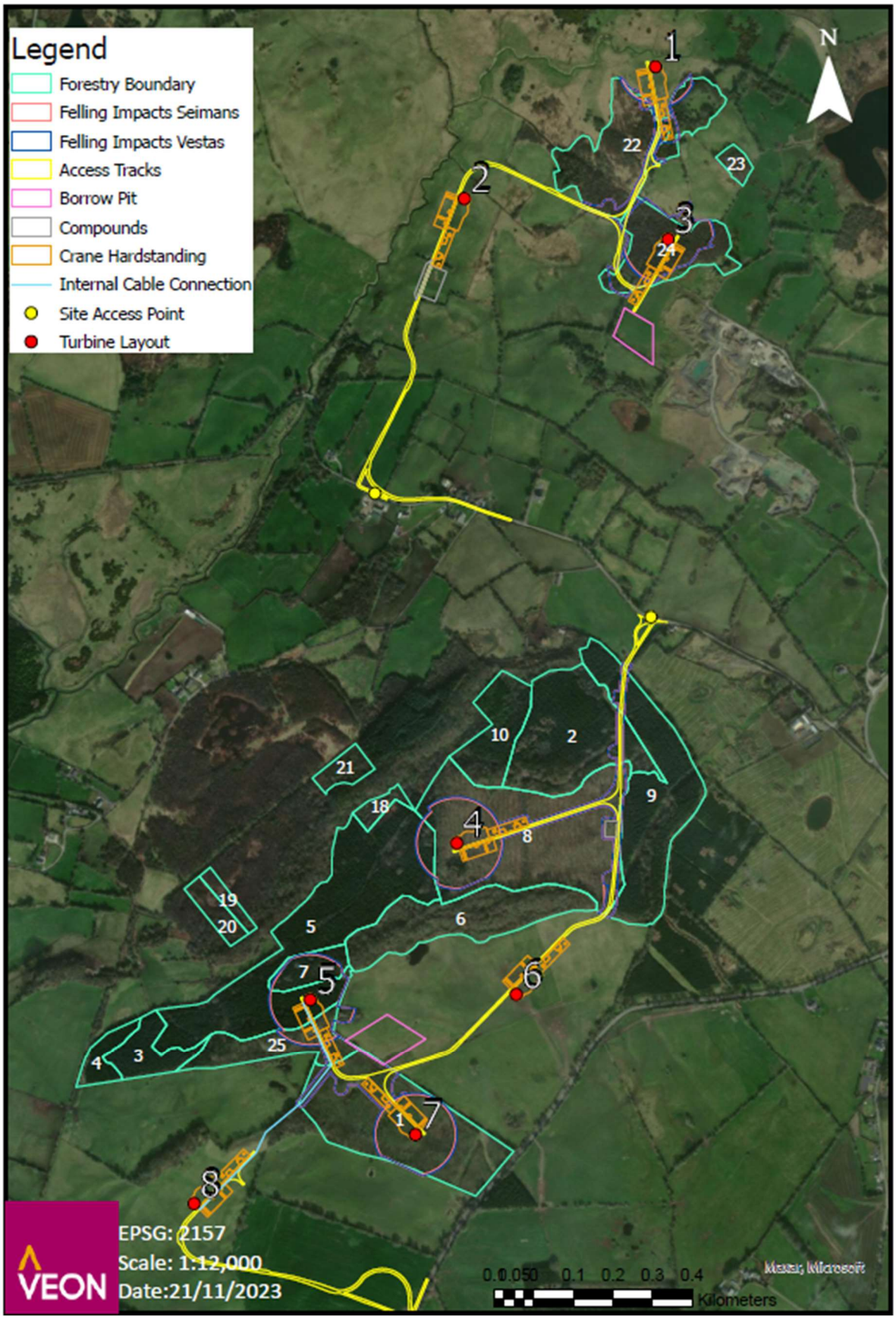
On sites where coups are not all clear felled at the same time, as is the case in most Irish commercial forests, the coup edges can create substantial edge effects with large wind whirls and even reverse circulations. These can create both larger still boundary layers and induce turbulence which can affect both turbine yield but also blade and power train life. These effects have been considered when designing the turbines to cope with these conditions.

The Impact of the Wind Farm on Trees

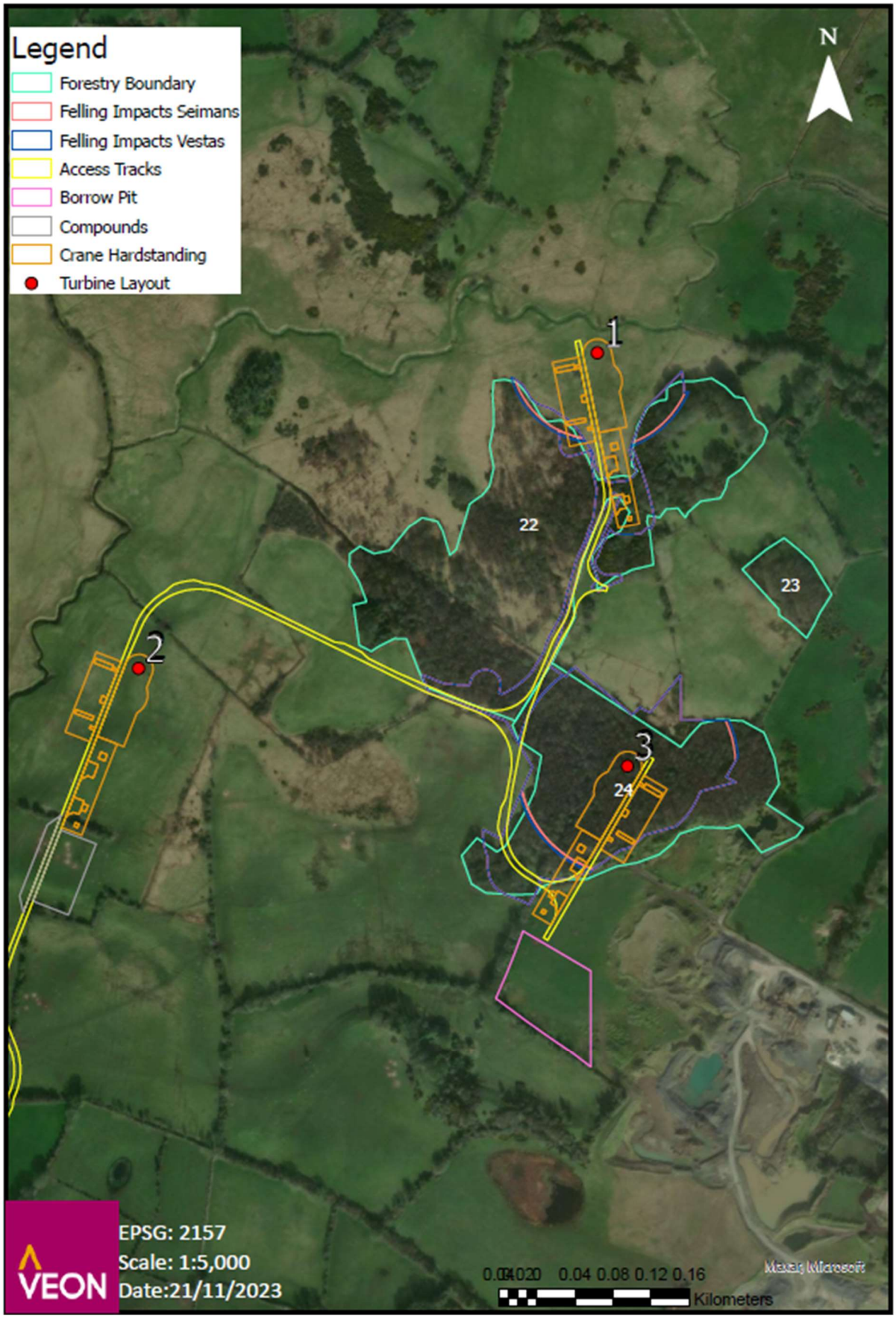
The removal of sections of forestry to accommodate turbines (and associated hardstands, access roads, bat buffers etc.) has the potential to impact remaining forestry and the local environment. Remaining forestry can sometimes be affected owing to various factors (e.g. aspect, top height, soil type, remaining tree shelter/support etc.). Opening areas of a forest for the construction of infrastructure and access tracks may lead to some trees becoming unstable and liable to windblow. This could in turn pose a health and safety risk. Other potential impacts include the encouragement of encroaching wind damage, drainage disturbance to existing drains, damage to surrounding trees during harvesting operations, release of sediment from the site and soil erosion or compaction. Mitigative measures for potential impacts are outlined later in this report.

To facilitate the access roads, civil works, bat buffers, turbine hardstands and temporary construction areas (etc.) approximately 20.09 hectares (assuming Vestas turbine specification) or 19.62 hectares (assuming Siemens turbine specification) will need to be clear-felled. This wind farm proposal plans to develop additional access roads into the forestry present on site - roads that are to be newly built for wind farm vehicles should be available for future forestry operations so that timber lorries can also use these roads. Roads constructed for wind farm developments will be built to a higher specification than that normally required for timber haulage.

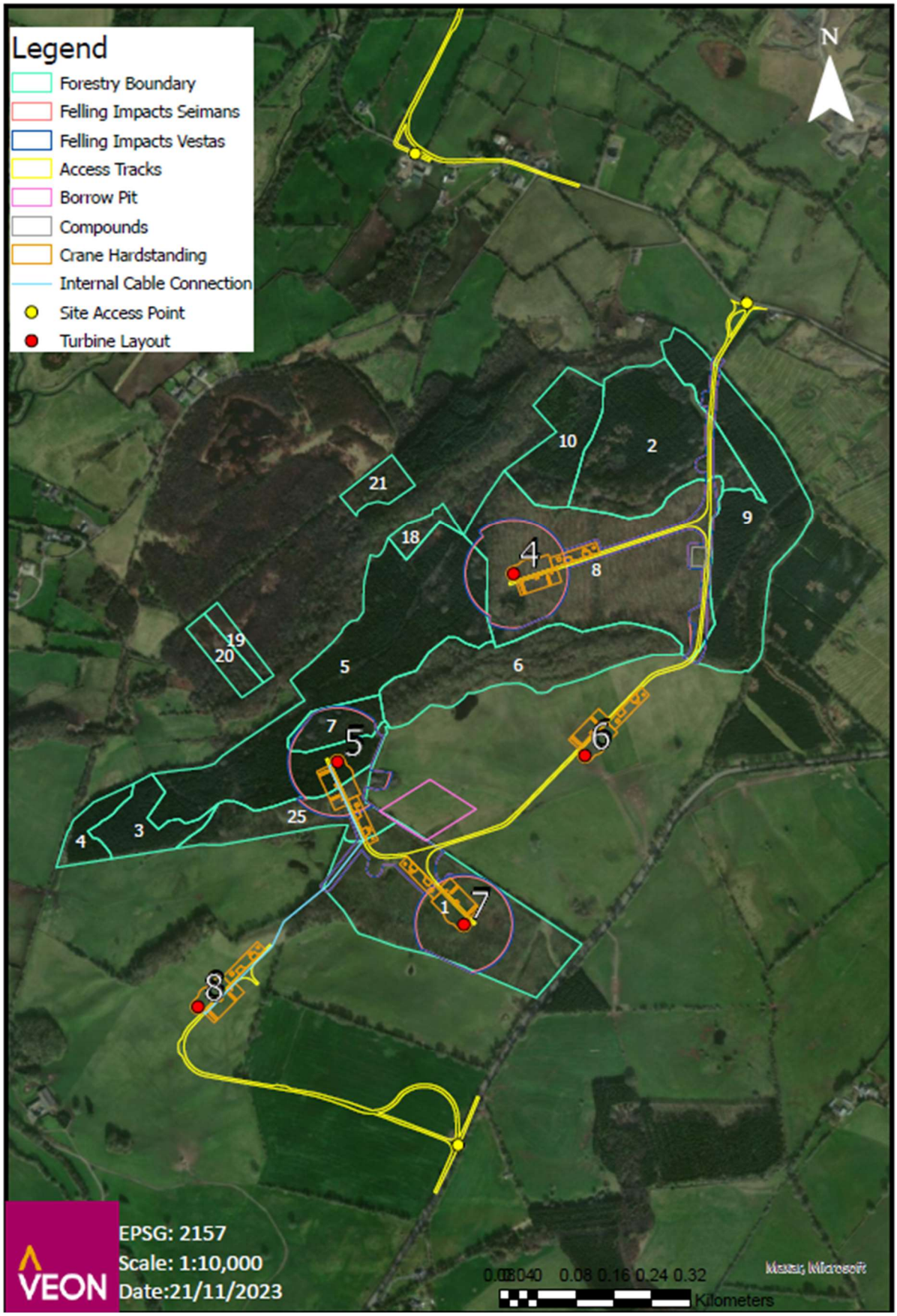
All turbine and tree felling locations are illustrated on the maps below on an orthophoto layer. The forestry that each turbine location overlaps with is also illustrated. As detailed above, the windfarm access is creating new paths through the forest creating new forest edges not previously exposed to wind.



Full layout of the wind farm development and forestry plots therein.



Northern Section of the wind farm development.



Southern Section of the wind farm development.

Proposed turbine locations T2, T6, and T8 are located outside of the forest perimeter and should not have any effect on the forestry. However, the forestry surrounding the proposed turbine locations for T1, T3, T4, T5 and T7 will potentially be affected by the proposed development.

The forestry present in the proposed locations for T1 and T3 is relatively poor and uncommercial, containing trees that are small in height and that are underlain by wet peat soils. The removal of trees this size is far less intrusive or potentially damaging to the surrounding forestry and removing areas to facilitate the turbines and new road infrastructure should not increase the risk of extensive windblow as the trees will have time to stabilise before the risk of windthrow materialises. While this area is made up of native broadleaf species, any native trees removed for this development will be replanted on replacement land(s) so the effect is temporary.

T5 is located near a sensitive area on the border of a potentially ancient woodland to the east: the development has moved T5 west to ensure hardstands, buffers and access roads will not affect the possible ancient woodland. T5 is now located in a predominantly commercial conifer woodland that has been thinned previously and will be thinned again in the future.

T7 is located within an area that was previously planted with ash, which was infected by ash dieback (*Hymenoscyphus fraxineus*) disease. These ash trees have now been removed and the area has been replanted with Sitka spruce, with additional broadleaf species planted around the edges. As a result, this plot is now very young, meaning the trees are small in height. Again, any clearance or removal of trees this size presents less risk of damage to the surrounding forestry. Removing areas of trees to facilitate the turbines and road infrastructure should not increase the risk of extensive windblow as the remaining trees will have time to stabilise before the risk materialises.

T4 is located in semi mature broadleaf forestry that has also been thinned previously and will be thinned again in the future.

For mature timber on moderately sloping ground, the harvesting method employed for any clear-felling programme would be expected, in the main, to comprise machine harvesting and extraction by a wheeled forwarder. The harvesting of broadleaves would typically be completed by chainsaw.

Photo 28 shows a harvesting machine felling a tree within a conifer stand. Photo 29 shows a forwarder stacking felled timber the roadside.

Potential Impacts of the Proposed Forestry Felling

Loss (or change) of habitats - The effects on loss or change of habitat are considered in the Biodiversity chapter of the EIAR. However, the following observations are made:

a. Where the trees on the site are of commercial stock, their lifecycle typically comprises felling and replanting for commercial use. Earlier felling of these areas is a temporal change, rather than a fundamental change of use.
b. Where the trees are broadleaf, one plot has already been removed due to disease, and the other is being managed as a commercial crop whose lifecycle comprises felling and replanting for commercial use. Earlier felling of this area is again a temporal change, rather than a fundamental change of use.
c. The total area removed from forestry on the site will be replanted on replacement land and thus does not present an overall wider loss of forestry habitat.

Mitigation

Throughout the design process, the proposed development has sought to minimise the areas of existing forestry to be removed. Most of the existing forestry within the development area would have been originally planted as part of a silvicultural rotation: this would have been due for future harvesting as a commercial crop, irrespective of whether a wind farm was being implemented or not. By the time the proposed development has reached the construction phase, some areas of mature forestry will have reached the end of its rotation naturally and may already have been felled or due for felling, and replanting can consider and and be planned around the development.

Other areas may need to be clear-felled earlier than the planned rotation length. Felling in these instances will be required to prevent the remaining areas of trees from becoming unstable and blowing over due to wind. While the period of this felling will be brought forward is not considered significant, various measures should be taken to minimise any potential adverse impacts.

A felling licence will be sought from the Minister for Agriculture, Food & the Marine who provides authority under the Forestry Act 2014 to fell or otherwise remove a tree (or trees) and to thin a forest for silvicultural reasons. This Act prescribes the functions of the Minister and details the requirements, rights and obligations in relation to felling licences. The principal set of regulations giving further effect to the Forestry Act 2014 are the Forestry Regulations 2017 (S.I. No. 191 of 2017).

Where a licence for the felling of trees is granted on or after 24th May 2017, the licensee shall erect a Site Notice, seven days prior to the commencement of and remain in place for the duration of harvesting operations.

Mitigative Measures (during associated Harvesting Operations)

In advance of harvesting operations commencing on the development site, there are several mitigative measures to be implemented to ensure the local environment is protected.

General Considerations

All associated harvesting operations must be conducted in strict accordance with the following standards and guidelines, which have been developed by the DAFM/Forest Service:

I. Forest Protection Guidelines
II. Forestry and Water Quality Guidelines
III. Forest Harvesting and Environmental Guidelines
IV. Forestry and Freshwater Pearl Mussel Requirements **-** Site Assessment and Mitigation Measures
V. Forest Biodiversity Guidelines
VI. Forestry and The Landscape Guidelines
VII. Forestry and Archaeology Guidelines
VIII. Code of Best Forst Practice – Ireland
IX. Irish National Forest Standard

Where a felling licence is granted, a number of conditions will be attached which must be strictly adhered to during harvesting and associated replanting operations. For instance, these would typically include the treatment of conifer tree stumps with fertiliser grade urea to mitigate against conifer root and butt rot disease (*Heterobasidion Annosum*), and the care and preservation of planted trees and maintenance of fencing for 10-11 years upon granting of licence or planting of the trees. Where approval is granted for deforestation, requirements for the replanting of replacement land(s) will be specified in an alternative replanting condition.

Other standard mitigative measures include:

- During the harvesting phase, works should only be conducted by experienced and fully competent operators. Operators must don all appropriate P.P.E. while working on-site.

- A safety statement must be issued to ensure that any dangerous or sensitive areas are well known to all relevant individuals. Additionally, the responsible forester will also walk the site with all contractors to highlight any prominent site risks or any sensitive habitats that are present.

- Up-to-date contingency plans will be designed according to section five of the 'Felling and Reforestation Standards' and will be triggered if necessary.

- Specific harvest plans should be designed for all associated harvesting operations. These should outline access points, setback areas, timber extraction routes, fuelling and chemical storage areas, log stacking areas, drain crossing points and include a Hazard Identification and Risk Assessment (HIRA).

- If deemed economically viable, the felling and subsequent extraction of timber should—as far as possible—be conducted at the same time as currently licensed extraction activities to minimise the risk of increased local traffic and noise disturbance.

- Any drains crossed during the extraction phase must be kept clear of any residues/debris to ensure no drainage issues arise for the remaining trees: which can be a major attributor to windblow.

Water Protection

- The CEMP (Appendix 2-2 of the EIAR) should be consulted by all on site operators before any work is completed.

- A 50m buffer distance between watercourses and any proposed development including construction activities including fuel storage has been applied to those watercourses within the Site. No works will occur within this buffer with the exception of the development of T1. Where the 50 m buffer cannot be provided at this location, a drainage report has been undertaken and mitigation measures provided for (see Technical Appendix 7-4).

- To capture and control suspended sediment, silt traps must be installed within relevant watercourses. These should be constructed along and towards the point of outflow of mound drains, where a firm bank exists, and a ten-metre 'buffer zone' containing sufficient vegetation (e.g. grasses, reeds, and shrubs) to filter out any remaining sediment and nutrients can be implemented. Figure 4.1 illustrates a silt trap, comprising a timber structure and a geotextile membrane attached which has been anchored securely in place. Silt traps must be cleared out periodically to ensure they remain fully functional. The build-up of sediment should be emptied onto a level section of the forest floor several metres from any relevant watercourses.

Silt trap in a forest managed by Veon.

- To further reduce the risk of run-off and sediment mobilisation, felling and extraction of timber should, as far as possible, be conducted during periods of dry weather.

- The refuelling and chemical/fuel storage area on-site must be sited in a dry, sheltered, flat location, at least fifty metres from any watercourses.

- Where it is necessary to cross relevant watercourses/drains during harvesting operations, temporary crossing points are required. These may comprise logs lined lengthwise and overlaid with a geotextile membrane and brash to capture falling soil from machinery wheels. The condition of temporary crossing points must be carefully monitored throughout operations, and these should be cleaned out and supplemented (as necessary). For aquatic zones, such crossings should be avoided as far as possible. Where it is necessary to cross an aquatic zone, a clear span log structure must be implemented.

Soil Protection

- Where timber extraction is required, the extraction route should be directed away from watercourses wherever possible, and the associated harvesting machinery must not encroach upon any established exclusion areas. Brash mats must be placed along all extraction routes to preserve soil quality. Additional brash layers should be deployed to reinforce short sections of soft ground which are subject to high levels of machinery passage. Brash mats must be replenished as soon as they exhibit signs of wear.

Brash mat on a harvesting rack

- Once harvesting of timber begins, harvesting operators must only use the designated extraction routes and loading/stacking areas marked on a harvest map. While harvesting operations are ongoing, every effort should be made to avoid any damage to the site. Operators should be reminded to regularly monitor any extraction routes for signs of soil damage and encouraged to use extra brash (where available) to pre-empt the risk of soil rutting on-site. Should ground conditions begin to visibly

deteriorate, a new track must be promptly established containing a new brash mat layer (Standards for Felling and Reforestation 2019).

- Timber must only be stacked in the designated stacking areas marked on a harvest map. Stacking must not occur within any setback areas and should be located greater than 100 metres from residential dwellings wherever possible.

- Load sizes should be carefully monitored during the timber extraction phase to further reduce the risk of soil compaction or rutting.

Habitats

Felling associated with a wind farm development can lead to fragmentation and a loss of commuting or foraging habitats for wildlife species. Careful consideration must be afforded to the presence of mammal or bird species within the development area, and protective measures should be prescribed for any wildlife features identified within the project area.
For instance a 30-metre (minimum) buffer zone should be implemented around a discovered badger sett, and no harvesting should occur within fifty metres of a sett during the badger breeding season (December-June inclusive) – See Chapter 5 of the EIAR.

- Hedgerows on-site should be retained and protected during harvesting as an important habitat for local fauna.

- Old and windfirm broadleaf trees should be retained where possible, especially where these contain deeply fissured bark, cavities, woodpecker holes etc.

- Deadwood should be left in situ following harvesting operations, which may comprise standing dead trees, logs deliberately left behind on the forest floor, or naturally fallen branches or stems.

Archaeology

All guidelines concerning forestry and archaeological features must be strictly adhered to.

- A twenty-metre (minimum) exclusion area must be created around any listed archaeological monument/site (SMR) within the development area. Machinery passage and timber stacking must strictly be avoided within this exclusion area.

- A 30-metre buffer zone should be used for any upstanding structures or buildings.

- Non-designated built heritage such as lime kilns, mill ponds, and derelict dwellings should be protected through a 10-metre operational buffer zone.

- Harvesting operators should be reminded to remain vigilant throughout felling operations for any undiscovered monuments/sites that may be present on-site. In the event such a feature is discovered, the appropriate authorities (i.e. National Museum of Ireland; the Garda Síochána; National Monuments Service) must be immediately notified, and a twenty-metre buffer area (minimum) must be implemented around the feature until the significance of the find has been investigated.

Landscape

The wider landscape should be considered during replanting works associated with the development, whether in situ planting or afforestation of replacement land(s).

To foster greater integration into a local landscape straight or horizontal lines in a forest should be avoided wherever possible. This can be achieved by implementing landscape setback areas at the planting stage. Wider and irregular spacing of trees close to the forest edge can also help to buffer conspicuous forest margins, and planting along forest edges with native tree species can improve the overall visual quality of the forest by providing contrasting textures and colours (Environmental Requirements for Afforestation, DAFM 2023).

For afforestation of alternative site(s) consideration will also be given to ensure new forestry will not block light and cast shade on neighbouring properties and public roads, and all guidelines relating to forestry and utilised buildings/dwellings and public roads will be strictly adhered to:

- A 60-metre planting setback to be implemented from the outer wall of any residential dwellings which are located proximate to forestry. Note: this may be reduced to a 30-metre setback with written permission from a landowner. The planting setback should vary in distance to avoid straight lines of forestry and to produce a more natural scalloped forest edge. Important local viewpoints should also be considered at this stage: these may be retained by introducing open spaces into a replanting operation.

- A 10 metre (minimum) planting setback must be implemented from the outer wall of any roofed farm buildings which adjoin a forest.

- A 10 metre (minimum) unplanted setback from the surfaced edge of any public road which crosses or adjoins a broadleaf forest.

- A 20 metre (minimum) unplanted setback from the surfaced edge of any public road which crosses or adjoins a conifer forest. Note: this may include a 10-metre-wide broadleaf strip planted between the edge of a conifer stand and the 10-metre road setback. The unplanted setback should be increased as appropriate to provide greater visibility where a public road bends.

Service Features

All overhead and underground utility lines (e.g. electricity; water; gas) must be identified prior to works commencing.

- Works that are scheduled to occur proximate to ESB powerlines should be conducted according to chapter seven of the ‘Forestry Standards Manual’ (DAFM, 2015). Where it is necessary to direct harvesting operations across unplanted powerline corridors, overhead goalposts and safety signage must be erected to ensure safe machinery passage beneath the lines.

Note regarding replacement lands planting: where overhead electricity powerlines traverse a site where afforestation is to occur a corridor of a certain width must be left unplanted as per the Forestry Standards Manual (DAFM, 2023). It is important to note that the unplanted area beneath a powerline cannot be considered as a replacement land area.

Replanting Obligations

Where the permanent removal of trees is envisaged, Forest Service policy is outlined for different tree removal scenarios – see *Felling and Reforestation Policy* document (available at: https://www.gov.ie/en/publication/19b8d-tree-felling-licences/).

During the construction phase of wind farm developments, there may be forest areas that require the temporary removal of tree cover to facilitate construction (i.e. construction felling). Once construction works have been completed, this land is then reforested in situ. The afforestation of alternative land(s) and the repayment of grant and premium payments are not required in these instances - there is no temporary felling required for this development.
Permanent removal of trees and forests is permitted in certain circumstances - mitigating measures form part of the decision-making process, including the afforestation of alternative lands and/or the refunding of grant and premium payments already disbursed by the Forest Service. The table below from Felling and Reforestation Policy (DAFM, 2017) summarises the six main scenarios where tree removal is permitted, and whether or not alternative afforestation and/or the repayment of grants and premiums are generally required.

The development near Knockanarragh relates to Scenario 2 in the table below and will thus require the submission of a felling licence for the consideration of the Forest Service. Upon appraisal of said application, the Forest Service will subsequently notify the applicant if the removal of trees has been licenced (or not), and will provide a date when tree felling may commence (typically 14 days after the approval date).

Scenarios	Felling Licence application required?	Alternative afforestation required? (See Note 1)	Refunding of grant & premiums required? (See Note 2)
1. Overriding environmental considerations (e.g. to protect habitats and species listed as qualifying interests within SACs and SPAs)	Yes	No	No
2. Supporting renewable energy and energy security (e.g. windfarm installation)	Yes	See Table 6	See Table 6
3. Commercial development (e.g. development of an industrial park)	Yes	Yes (see Note 3)	Yes
4. Conversion to agricultural land (see Note 4)	Yes	Yes	Yes
5. Public utilities (e.g. erection of an electricity power line)	No (see Note 5)	No	Yes
6. Other land use change (may be considered on a case-by-case basis, on application)	Yes	Case-by-case	Case-by-case

Note 1 If 'YES', the alternative site must be of an area equivalent in size. Section 5.7 in the above reforestation policy sets out the procedures required. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.

Note 2 If 'YES', the refunding of any afforestation grant and premiums already paid out by the Forest Service is required if the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme. In addition, if premiums are still being paid, premium payments on the area will cease.

As shown in the table below, replanting in situ on the site at Knockanarragh would be required for any construction and turbulence felling, though no replacement land(s) would be required (except for turbulence felling > 20 hectares).
However, the sourcing and subsequent afforestation of spatially consistent replacement land(s) is required for all infrastructural felling associated with the project. Repayment of previously disbursed grant and premium payments is also required and where the receiving forestry plots are still in receipt of premium payments, these will cease upon felling works.

Table 6 Requirements for each category of felling associated with wind farm development, regarding reforestation, alternative afforestation, and the refunding of grant and premiums.

Category of tree felling		Reforestation of felled area required?	Alternative afforestation required? (See Note 1)	Refunding of grant & premiums required? (See Note 2)
Infrastructure felling		No	Yes	Yes
Construction felling		Yes	No	No
Turbulence felling	≤20 ha	Yes	No	No
	>20 ha	Yes	Yes, 10% turbulence fell area – see Section 5.3.2.4	No

Note 1 If 'YES', the alternative site must be of an area equivalent in size. Section 5.7 sets out the procedures required. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.

Note 2 If 'YES', the refunding of any afforestation grants and premiums already paid out by the Forest Service is required if the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme. Also, if 'YES' or 'NO', if premiums are still being paid, premium payments on the area will cease.

Felling and Reforestation Policy (*DAFM 2017).*

To facilitate the Proposed Development, 20.09 ha (assuming Vestas turbine specification), or 19.62 ha (assuming Siemens turbine specification) of existing forestry—comprising mostly Norway spruce, Ash, Birch and Sycamore—will need to be clear-felled for infrastructural felling purposes. As previously outlined, all of this area needs to be replaced and suitable replacement land will be sourced and non-grant-aided approval for afforestation of this land will be sought from the Department of Agriculture, Food and the Marine. The felling requirement with respect to access roads and other infrastructure for the Vestas turbine specification is less than the Siemens turbine specification because there is greater overlap between the Vestas buffer and its associated access roads and infrastructure.

Turbines	Area of forestry lost (Ha) Vestas	Area of Replacement land Required (Ha) Vestas	Area of forestry lost (Ha) Siemens	Area of Replacement land Required (Ha) Siemens	Species present
1, 3, 4, 5, 7	14.24	14.24	13.65	13.65	Norway spruce, Ash, Sycamore, Birch.
Access roads & other infrastructure	5.84	5.84	5.97	5.97	Norway spruce, Ash, Sycamore, Birch.
Total:	**20.09**	**20.09**	**19.62**	**19.62**	

The following will also apply concerning the afforestation of replacement land(s):

1. The proposed afforestation of alternative land must be evaluated and (if deemed suitable) approved by the Forest Service under the Forestry Act 2014 and associated Regulations, before the associated felling licence can be granted.
2. The proposed alternative land should be submitted for afforestation approval as early as possible, ideally at the same time as the felling licence application is submitted.
3. Afforestation approval must be applied for using the Afforestation Pre-Approval Form (Form 1) or electronically via iNET.
4. If the forest area proposed for permanent removal is still in receipt of premiums and / or is still in contract under the Afforestation Grant & Premium Scheme, the alternative site may be eligible under the Afforestation Grant & Premium Scheme.
5. The standard procedures regarding the evaluation of afforestation applications generally will apply, regarding referrals, protocols (e.g. acid sensitivity protocol), AA Screening, EIA determination, etc.
6. It will be a condition on the felling licence (if issued) that the alternative land approved for afforestation is planted and managed as forest land, in accordance with the relevant standards set out in the *Forestry Standards Manual* (DAFM 2023)

The Forest Service may also require the developer to report on the potential loss of soil and biomass CO_2, and the reduction in productivity of the forest area associated with different wind farm forest management and landscape plans.

While the impacts of the felling activities are considered at this application stage it is noted the felling of trees at the site for the purposes of the wind farm is subject to and can only occur following the grant of a felling licence by the Forest Service. Planning permission for the project may not be granted or, if granted, may have amendments introduced by condition(s). Therefore, the extent of felling required to be licensed for the purpose of giving effect to the windfarm project can only be determined once planning permission for the windfarm project has been granted.

Furthermore, it will be a condition of the felling licence that an equivalent area of land required to be felled shall be replanted as per Forest Service Felling and Reforestation Policy. Thus, the extent of the lands required for afforestation can also only be known once planning permission has been granted for the windfarm project. In these circumstances, the application for the licence can, in practical terms, only be made once planning permission has been

granted. The first step of this process involves sending a non-grant-aided afforestation licence application (for replacement land) and a felling licence application to the Department of Agriculture, Food and the Marine. This will outline everything proposed for the site, from areas proposed for felling and species to be planted, to fencing and fertilizer requirements and the drainage and ground preparation required to establish trees.

An application checklist for renewable energy projects requiring a tree felling licence application is presented as an appendix.

Conclusion

The Proposed Development requires the removal of trees through mechanised timber harvesting to facilitate various components of the proposed wind farm infrastructure. On the proviso that the proposed mitigation measures are adopted and considering that the level of tree removal required is considered insignificant, no significant residual impacts are hereby expected. Through prudent planning and careful monitoring of the related harvesting operations, the required trees can be removed from the development area without negative implications for the local environs.

Appendix

Checklist for renewable energy projects requiring a tree felling licence application

1	**A fully completed Tree Felling Licence application as per DAFM Circular 1 of 2021.**	☒
2	**Where possible, a single felling licence application for all felling required in respect of the renewable energy or energy infrastructure project. The licence application form should list all landowners and include all relevant folio information, and where applicable, include consents from those landowners. Tree felling licence maps should also clearly identify land folios and associated landowners (where applicable).**	☐
3	**A Certified Species Map (scale 1:5000) including the felling areas consistent with the project area and any tree felling areas identified in maps and documents included in the planning permission.** ***Note: if the relevant forest plots are not all evident at 1:5,000 scale, include as many maps as required at 1:5,000 to highlight all plots, and one map at a larger scale (e.g. 1:10,000) showing all the plots together.***	☐
4	**A Harvest Plan and associated Maps (scale 1:5000), as per DAFM Circular 11 of 2019. The plan and maps must clearly state and illustrate the harvesting operations that are planned on a site, and detail proposed measures to protect environmental and social features. The plan must describe the project area, environmental receptors (e.g. water features; biodiversity habitats), buffer zones/setback areas, existing infrastructure (e.g. electricity powerlines), the existing/planned forest road, location of crossing points and maintenance/refuelling areas, and operational details (e.g. extraction routes; stacking areas) .**	☐
5	**A copy of the approved planning permission(s) and any historic planning grants relating to the renewable energy or energy infrastructure project involving tree felling requiring a felling licence(s). To be submitted via email to: felling.forestservice@agriculture.gov.ie and/or by supplying a URL to an online secure document repository which includes the relevant planning documents), if planning is secured at the time of application. DAFM can receive the felling licence and process it to a certain extent, e.g. registration, digitising, referrals, FIRS etc. However, under current policy, DAFM do not issue a felling licence until the grant of planning issues from the first authority (Local Authority or An Bord Pleanála).**	☐
6	**EIAR & NIS and related information, environmental reports or other information submitted to the first Consent Authority (Local Authority and/or An Bord Pleanála). To be submitted via email to: felling.forestservice@agriculture.gov.ie and/or by supplying a URL to an online secure document repository which includes the relevant planning documents).** • **The EIAR, NIS and other planning documents are required by DAFM to assess the licence.** • **DAFM is the second authority in the case of such granted developments where felling is involved. DAFM, acting as the consenting authority for felling activity, can take account of the content in the related EIA and NIS for the primary project and use this information to determine if there are any potential impacts resulting from the felling activity.**	☐
7	**A spatial database of the footprint of the felling areas (i.e. polygon shapefile in the Irish Transverse Mercator (ITM) Coordinate System) consistent with grant of planning for the associated energy development. To be submitted via email to:**	☒

	felling.forestservice@agriculture.gov.ie	
8	**A Tree Felling Licence application cover letter which identifies a dedicated point of contact and relevant contact details for any technical queries that DAFM may have in respect of the application, or related planning documents or spatial data submitted (i.e. postal and email addresses and telephone numbers).**	☐
9	**Where applicable, a new NIS that includes any proposed tree felling operations not already considered in the EIAR & NIS for the parent project.**	☐
10	**Alternative lands need to be approved for afforestation by DAFM before the felling licence can be issued. The alternative lands must also be in the ownership of the licensee seeking the felling licence (i.e. the wind farm developer).**	☐