Forestry Report

Proposed Windfarm at Tirawley, Co. Mayo.

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June 2025

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Definition of Terms

- **Afforestation:**
  The establishment of a forest in areas where the preceding land use was not forestry.

- **Age Class:**
  The age range of tree crops divided for classification or use. Also pertains to trees included in such an interval.

- **Aquatic zone:**
  Any natural river, stream or lake (but not an artificial drain) illustrated on an Ordnance Survey 6-inch map.

- **Brash Mat:**
  A protective layer comprised of residual woody debris from harvested trees (i.e. brash) that is laid along machinery routes to preserve soil quality. Brash mats help to spread out the weight of heavy machinery and to decrease soil compaction.

- **Clear-felling:**
  Typically, the final stage in a commercial forestry crop cycle, where an entire standing crop of trees is removed from an area.

- **Construction felling:**
  Relates to the construction phase of a wind farm development, where the temporary removal of trees is required to facilitate the construction works (e.g. borrow pits for stone, temporary site compounds etc.)

- **Coupe**
  A designated area of forest where the felling of trees is planned or has occurred – coupes can vary in size and shape.

- **Eutrophication:**
  A process where a high concentration of nutrients has been introduced into a watercourse which promotes excessive growth of algae which can deplete oxygen levels in the water and deleteriously affect aquatic life.

- **Exclusion Zone (or buffer zone)**
  Describes a specific area where harvesting machinery is not permitted to operate or traverse for environmental protection.

- **Forest certification:**
  A voluntary process through which the quality of forest management is assessed by an independent third-party against an agreed set of standards and principles.

- **Hectare:**
  A unit of land area equal to 10,000 square metres or 2.4711 acres.

- **In check (trees…):**
  Describes trees that are displaying signs of stunted growth.

- **Infrastructure felling:**
  Describes trees that are permanently removed from a site in order to make way for infrastructure associated with the wind farm, such as access roads and turbine bases.

- **Mound Drain:**
  Formed by an excavator digging drains at regular intervals and heaping the excavated soil in mounds. Trees are then planted into the mounds, which provide an elevated vegetation-free zone.

- **Plantation:**
  A forest stand established by planting or seeding during afforestation or reforestation.

- **Relevant watercourse:**
  Any other watercourse that has the potential to act as a pathway for the movement of significant amounts of sediment and/or nutrients from the site to an aquatic zone. These include existing drains/channels and other potential pathways that may contain flowing water during and immediately after periods of rain.

- **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.

- **Sawlog:**
  The most profitable wood product that is widely used for construction. Sawlogs are logs that are 3.7 metres (or greater) in length and have a minimum diameter of 20cm.

- **Setback area:**
  Setback areas are used at the afforestation or replanting stages to introduce a buffer strip between a new forest and sensitive habitats or features, which is then managed for environmental protection and enhancement.

- **Silviculture:**
  The art and science of producing and tending a forest: the theory and practice of controlling forest establishment, composition, growth, and quality of forests to achieve the objectives of forest management.

- **Stand:**
  An aggregation of trees occupying a specific area and uniform enough in composition (species), age and arrangement to be distinguishable from the forest in adjoining areas and considered a homogenous unit for management purposes.

- **Turbulence felling:**
  Felling in the vicinity of turbines for the purpose of avoiding air turbulence that can be created by the forest canopy. It is carried out in order to increase the efficiency of the turbines and to reduce stress on the turbine components by reducing vibrations running through the blades.

- **Water hotspot:**
  An area of potential source of sediment or nutrient loss during harvesting and/or afforestation works (e.g. flushes, springs and areas of soft ground).

- **Windblow (or windthrow)**
  The uprooting/overturning of trees by wind.

- **Yield Class (YC):**
  Defined as the potential growth rate or yield of a forest, expressed as cubic meters per hectare per year.

Forest overview

Forest Location

The forest is located approximately 5 kilometres east of Ballycastle, County Mayo. There are numerous forest roads accessing the forests in this study area, with the main approaching road being the R314 (Killala – Ballycastle). The geographic location presents restricted access to the harvesting network of timber buyers nationwide as the site is quite isolated in the northwest of the country.

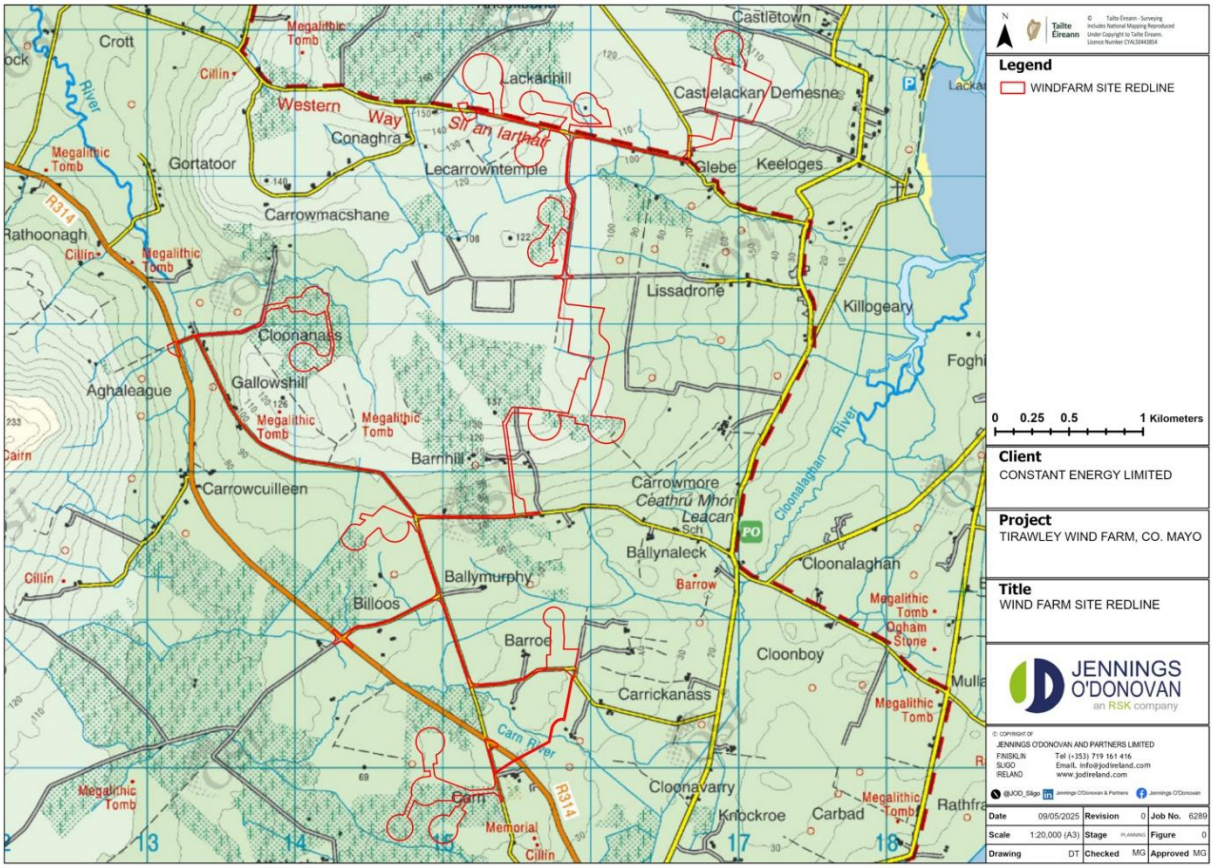

Figure 1: *Location of proposed wind farm.*

Forest Description

The proposed development redline area contains approximately 49 hectares of forestry, all of which is under private ownership and is being managed on a commercial basis. None of the forestry impacted by this development is currently being managed under forest certification.

Some of the affected areas of forestry within the project area are of relatively low yield class, while other areas are displaying reasonable growth. The range of services that these forests provide would be limited but would encompass carbon capture and some biodiversity and recreation.

Figures 2, 3 and 4 illustrate the locations of the existing forestry growing within the proposed project area.

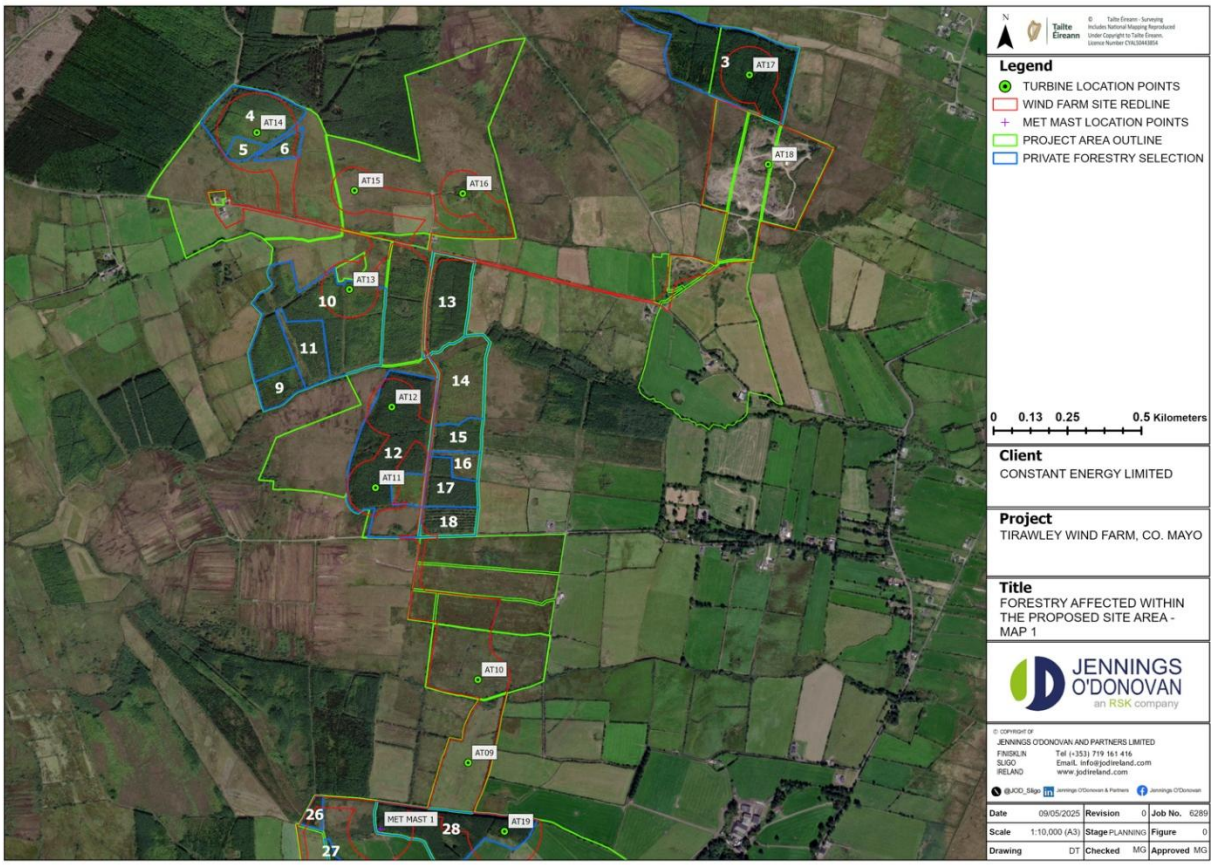

Figure 2: *Forestry interacting with wind farm infrastructure (1 of 3).*

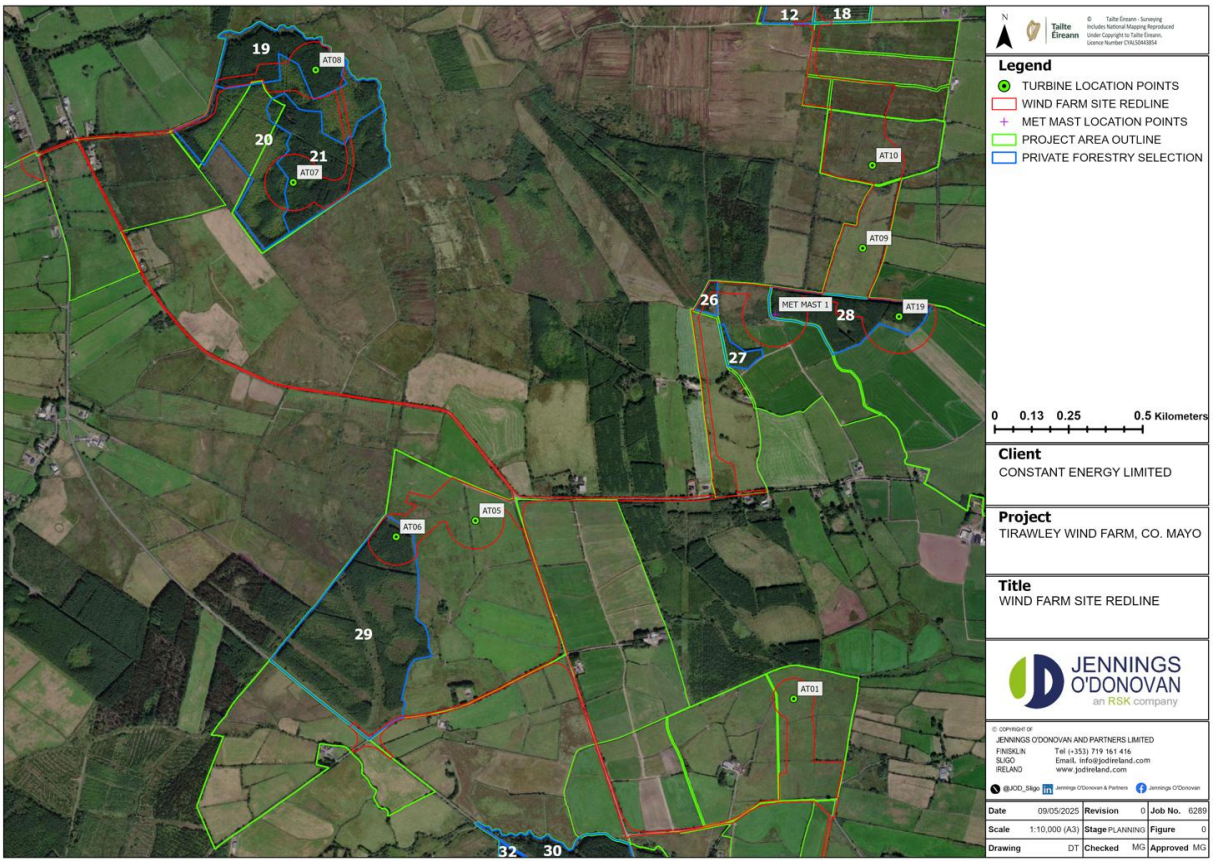

Figure 3: *Forestry interacting with wind farm infrastructure (2 of 3).*

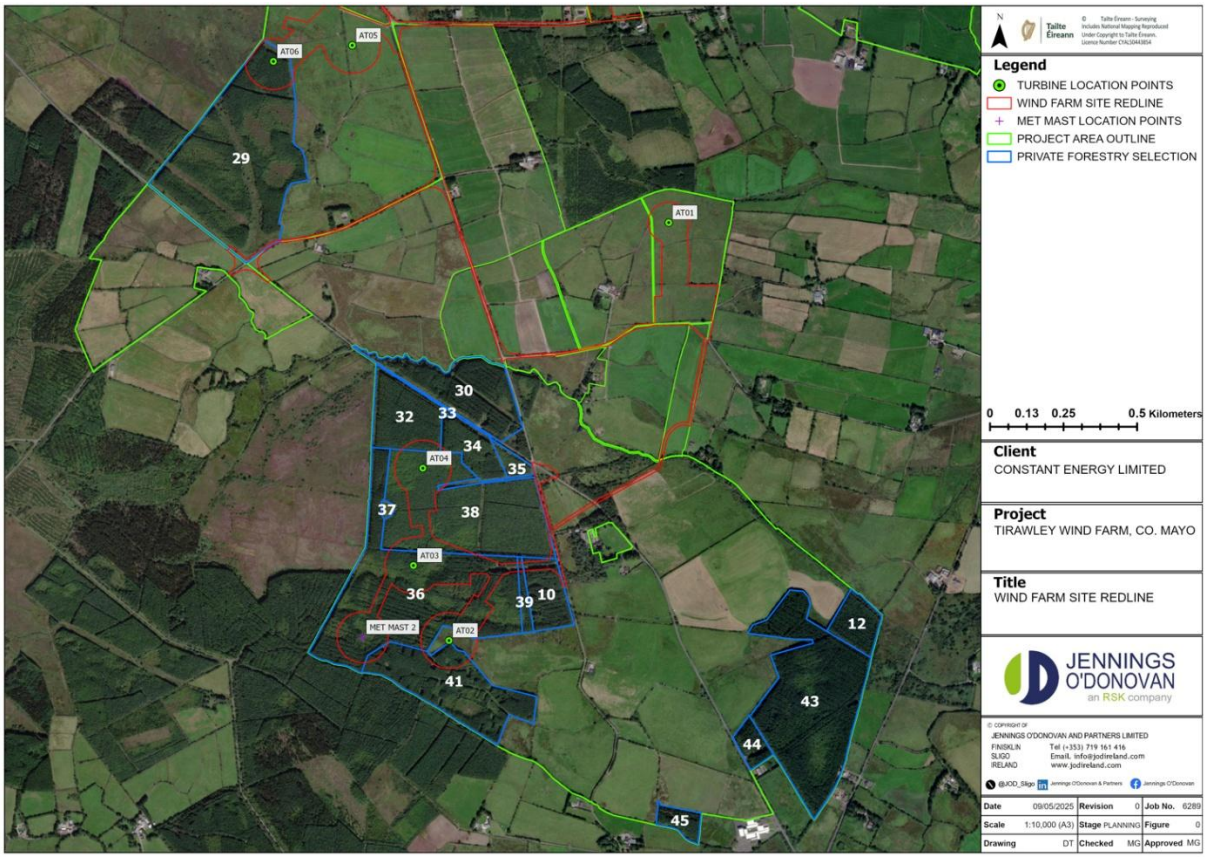

Figure 4: *Forestry interacting with wind farm infrastructure (3 of 3).*

The proposed wind farm layout affects forestry at 12 of the 19 planned turbine locations. Additionally, both Met Mast locations and parts of the proposed access roading overlap with forested areas. To enable the construction of the wind farm, the overlapping forestry will first need to be cleared of trees. A summary of the affected forestry is presented in Table 1.

Table 1: *Overview of existing forestry interacting with proposed wind farm infrastructure.*

Plot No.	Infrastructure	Species Mix[1]	Plant Year	Est. Yield Class
3	AT17 + Access roading	SS, LP	2000	22
4	AT14	SS, JL	2010	16
5	AT14	SS, JL	2010	6
6	AT14 + Access roading	SS, JL	2010	6
10	AT13	SS, JL	2010	20
12	AT11 + AT12 + Access roading	SS, JL	2004	22
13	Access roading	SS, ADB	2011	22
18	Access roading + Public road widening	Ash, ALD	2009	4-8
19	AT08 + Access roading	SS, JL	1998	20
20	AT07 + AT08 + Access roading	SS, JL	1998	14
21	AT07 + Access roading	SS, JL	1998	18
26	Access roading	SS, LP, JL	2005	20
28	AT19 + Access roading + Met Mast 1	SS, JL	2000	20
29	AT06 + Public road widening	SS, JL	2001	22
32	AT04	SS, JL	2003	24
34	AT04	SS, JL	1999	24
36	AT02 + AT03 + Met Mast 2 + Access roading	SS, JL	1994	20
38	AT03 + AT04 + Access roading	SS, JL	2013	24
39	Access roading	SS	1999	20
41	AT02 + Met Mast 2	SS, JL, BI	1999	20

[1] * SS = Sitka spruce; LP = Lodgepole pine; JL = Japanese larch; ADB = Additional broadleaves; ALD = Alder; BI = Birch

The forests within the affected areas are mixed in terms of timber quality - some of the forestry overlapping with the proposed wind farm layout comprises of poor-quality trees, with low yield class productivity and which will likely result in a low-quality timber product at rotation-end. Other areas were observed to be growing well and are likely to produce high-quality sawlog. To date, some of the existing forestry has been managed under a no-thin policy, whereas areas underlain by better soils have previously been thinned. A proportion of the existing forestry is at an early stage of the growing cycle and will not be eligible for harvesting for several years. Harvesting infrastructure will need to be designed and built before this can be achieved - the proposed windfarm road layout will aid as an access option to remove some of this timber.

Plate 1.

Plate 1 illustrates the access road into plot 3 south of AT17, the trees present at the approximate location of AT17, and the exposure of the site as seen from plot 3.

Plate 2.

Plate 2 illustrates the trees present at the proposed location for AT14 in plot 4, the bog looking towards the entrance to AT14 where ESB wires split plots 4 and 6, and the approach road giving access into AT13.

Plate 3.

Plate 3 illustrates the forestry located at the approximate proposed location of AT13 in plot 10, the proposed location for AT11 in plot 12, and proposed location for AT12 also in plot 12.

Plate 4.

Plate 4 illustrates the existing trees located at the approximate location where the construction of AT11 is proposed (as viewed from the farmers field beside plot 12), the trees situated at the proposed location for AT08 in plot 19, and the trees and wet soil conditions present at the proposed location for AT07 in plots 20 and 21.

Plate 5.

Plate 5 illustrates the existing road leading towards plots 26 and 28, the existing access road leading towards plot 28, and the type of trees situated at the approx. proposed location for Met Mast 1 and AT19 in plot 28.

Plate 6.

Plate 6 illustrates the existing access road through plot 40 which leading towards plots 39, 36 and 41, the poor-quality trees and wet ground conditions at the approximate proposed location of AT04 in plot 32, and the younger trees to the left of plot 38 - with the older trees in plot 38 found to the right of a ringfort [MA014-056----] in plot 37.

Plate 7.

Plate 7 illustrates the good-quality trees growing in plot 38 leading towards AT04, and the poor-quality trees and wet ground conditions at the proposed locations of Met Mast 2 and AT03 in plot 36.

Plate 8.

Plate 8 illustrates a water course outside of plot 41 and the good-quality trees growing at the proposed location of AT02 within plot 41.

Felling Methodology

Felling typically entails the cutting down of trees and the extraction of timber to the roadside, usually during thinning or clear-felling operations. Felling can only be conducted when a tree felling licence has been granted by the Minister for Agriculture, Food, and the Marine. A felling licence provides authority under the Forestry Act 2014 to fell or otherwise remove a tree, or trees, or to thin a forest for silvicultural purposes. The Forestry Act 2014 prescribes the functions of the Minister and details the requirements, rights, and obligations associated with tree felling licences. The Forestry Regulations 2017 (S.I. No. 191 of 2017) are the principal set of regulations giving further effect to the Forestry Act of 2014.

Harvesting types

Thinning is a silvicultural intervention that removes inferior-quality trees from a stand. It affords the remaining stems more growing space and resources, thereby increasing the overall quality and size of the remaining forest and producing a more saleable product. First thinning in conifer forests typically involves the complete removal of every sixth or seventh line of trees (called racks) to gain access to a forest, while inferior trees are then selected for removal between these racks. The resulting timber is generally used for pulpwood, fencing, pallet products or wood energy (Teagasc, 2013).

Clear-felling is the harvesting of all marketable trees in a given stand at the end of a forest rotation, which is generally followed by replanting of the stand to replace the harvested trees (Forest Service, 2000b). Clear-felling typically occurs when a conifer forest is 30-50 years old, and much later for a broadleaf forest.

Continuous Cover Forestry (CCF) is an alternative silvicultural approach to clear-felling where trees are periodically removed from a forest, though the forest canopy is permanently maintained, and no felling coupes are formed. As outlined in DAFM (2017), CCF is applicable where timber production is an objective but where other considerations would benefit from continuous forest cover (e.g. biodiversity or recreation), or where a conifer plantation is to be converted into a native woodland owing to proximate environmental sensitivities (e.g. a high-status objective waterbody).

Harvesting operations

Harvesting operations may involve the felling of selected trees, the removal of branches, the cross-cutting of stems into size categories, the stacking of logs along tracks in the forest and extraction of timber to the roadside for loading onto timber lorries. During wind farm construction, ‘keyhole’-type felling is sometimes carried out which concentrates on the felling of smaller coupes of forestry within the wind farm infrastructure layout.

Manual felling of trees

Up until the early 1990s, motor-manual felling of trees with chainsaws was the predominant harvesting method but was eventually replaced by mechanised harvesting. Today, manual felling remains a useful option in small-scale forestry, or where trees stand within an exclusion zone - outside the reach of the harvesting arm and where machinery access is precluded (Teagasc, n.d.).

Mechanised felling of trees

Mechanised harvesting is currently the predominant method of tree felling in Ireland and involves purpose-built ground-based machines called harvesters (Figure 5). These are self-propelled machines, fitted with specialised cutting heads that are capable of felling and processing tree stems. The machine operator controls the movement of the machine from the harvester cab, which contains an onboard computer system that can be programmed to cut standing trees to the size and length specified by the customer. The harvester will process trees down to 7cm in size. The remainder of the trees will be placed on the rack in front of the harvester, along with the branches, to function as a brash mat for the harvester to travel on, reducing the risk of soil damage.

Figure 5: *A conventional forestry harvester.*

The processed logs are placed to the side of the rack where the forwarder can easily access them as it follows the harvester. The harvester also treats conifers tree stumps with urea as it fells trees, preventing butt rot disease (*Heterobasidion annosum*) in the future. This is generally a condition of a felling licence where the soil type is mineral soil or where a peat soil is less than 25cm (excluding the litter layer). The application of urea is not permitted within 10m of an aquatic zone or a relevant watercourse (DAFM, 2019).

Timber extraction

To remove timber from the forest, specialised wheeled machines called forwarders (Figure 6) are the most widely used extraction method in Ireland. A forwarder contains a base machine similar to a harvester but comprises a powered trailer with a hydraulic grapple arm attached for picking up logs. A forwarder follows a harvester to collect and extract logs to the roadside, where timber is stacked for loading onto timber trucks. These machines can typically remove circa 9–12 tonnes of timber per journey (Teagasc, n.d.).

Figure 6: *A conventional forestry forwarding machine.*

Environmental Considerations

Harvesting, of all the forest operations, has the potential to have an impact on the forest environment and the wider landscape. Strict DAFM/Forest Service guidelines, as detailed in the mitigation section, have been developed to ensure best practice during harvesting works in order to safeguard soils, watercourses, wildlife habitats and ancient heritage sites.

Harvesters and forwarders have been developed and designed to minimise soil damage, bearing large soft tyres to spread the machine weight over a wide area. In addition, it is standard forestry practice to lay dense layers of the brash and branch wood from felled trees

along machinery routes, which forms a thick carpet of foliage for harvesting machinery to travel over, protecting the soil from compaction and rutting.

Harvesting operations are typically scheduled according to the nature of the underlaying soil, with sites being categorised into winter and summer sites depending on ground conditions. Best practice also requires the cessation of mechanised harvesting operations during and immediately after periods of heavy rainfall which may result in the surface mobilisation of silt.

Water features are particularly vulnerable to the effects of harvesting as silt/residues arising from harvesting and machinery movement can enter watercourses and form a barrier for the movement of aquatic life. Additionally, nutrients released from decaying branches, particularly from large, clear-felled sites, can cause eutrophication of aquatic zones. To counteract these effects careful planning is required in carrying out harvesting operations. Some of the measures taken to avoid impacts include:

- Limiting the size of the areas to be felled which reduces the amount of nutrients and silt released.

- Minimising the crossing of drains and streams, but where necessary installing temporary structures (log bridges, pipes etc.) to avoid machines entering the water.

- Establishing exclusion zones around waterways from which machines are excluded.

Similarly, 20 (+) metre exclusion zones are left around all known archaeological sites for their protection. Sometimes an unrecorded archaeological site or artefact is discovered, and the area is excluded from the harvesting operation and left undisturbed and the relevant authorities notified.

The noise and impact of harvesting operations can have an impact on wildlife habitats. Therefore, when planning felling operations care must be taken to ensure that important wildlife habitats are 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. The timing of harvesting may be delayed until after the nesting season is completed, to minimise damage to bird life.

Deadwood is also typically left in situ, in the form of standing dead stems or naturally fallen trunks, or as logs deliberately left behind on the forest floor. As these decay, they provide habitat for fungi and insects which in turn supports other animal and bird life.

The effects of clear-felling, where entire forest stands are removed in one operation, can have a significant impact on the landscape unless carefully carried out. In Ireland, afforestation (establishment of new forests) has resulted in many adjacent conifer plantations being established within a 2–3-year period creating a large uniform area of forest which requires harvesting at the same time. Foresters are now restructuring these forests to create greater diversity in subsequent rotations. 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 class diversity.

Potential Impacts

Potential impact of trees on wind turbines

A forestry crop, with a typically rough and uneven canopy, acts as a barrier to the wind and can cause wind shears (i.e. changes in wind speed and direction). Forestry in proximity to a wind turbine can give rise to substantial turbulence than what would otherwise occur over more open ground. This can reduce the overall wind speed above the forest canopy and turbulent airflow can send vibrations through the turbine blades, leading to increased stress on the turbine drive trains and a reduced capacity to exploit wind-generated energy (Department of Agriculture, Food and the Marine, 2017; Irish Wind Energy Industry, 2012).

Potential impact of wind farms on forestry

The removal of sections of forestry to accommodate the proposed wind farm infrastructure holds the potential to impact remaining trees and the local forest environment. Potential impacts include the encroachment of windblow into forest stands, disturbance to the existing drainage network, damage to soil (i.e. erosion, rutting and compaction) or surrounding trees during harvesting, and sediment inputs into sensitive environmental receptors (e.g. rivers or streams).

Where areas of trees are cleared, the remaining forestry can sometimes be impacted depending on a number of factors (e.g. aspect, elevation, underlaying soils etc.). Opening up areas of the forestry for infrastructure and access roading may lead to some trees becoming unstable, and thus prone to windblow. This section of the report outlines the perceived impacts of the necessary felling on the surrounding forestry to remain.

To facilitate the proposed project infrastructure, approximately 44.51 ha of existing forestry will first need to be felled. The proposed turbine layout will require additional access roading to be built through forested areas. The new proposed access roading will be designed and built to a specification that will allow timber lorries to use these roads in the future. Roads constructed for wind farm developments will be built to a higher specification than that normally required for timber haulage.

Outside of the required felling areas, the proposed turbine layout seeks to maximise the use of existing forestry access routes. As a foundation already exists in these areas, widening and building up of the existing road network will only be required, which will help to minimise impacts on habitats, soils and the remaining forestry.

Figures 7, 8 and 9 illustrate the proposed felling areas that are required to enable the wind farm construction. The proposed locations of AT01, AT05, AT09, AT10, AT15, AT16 and AT18 do not overlap with existing forestry so potential impacts were not considered at these locations.

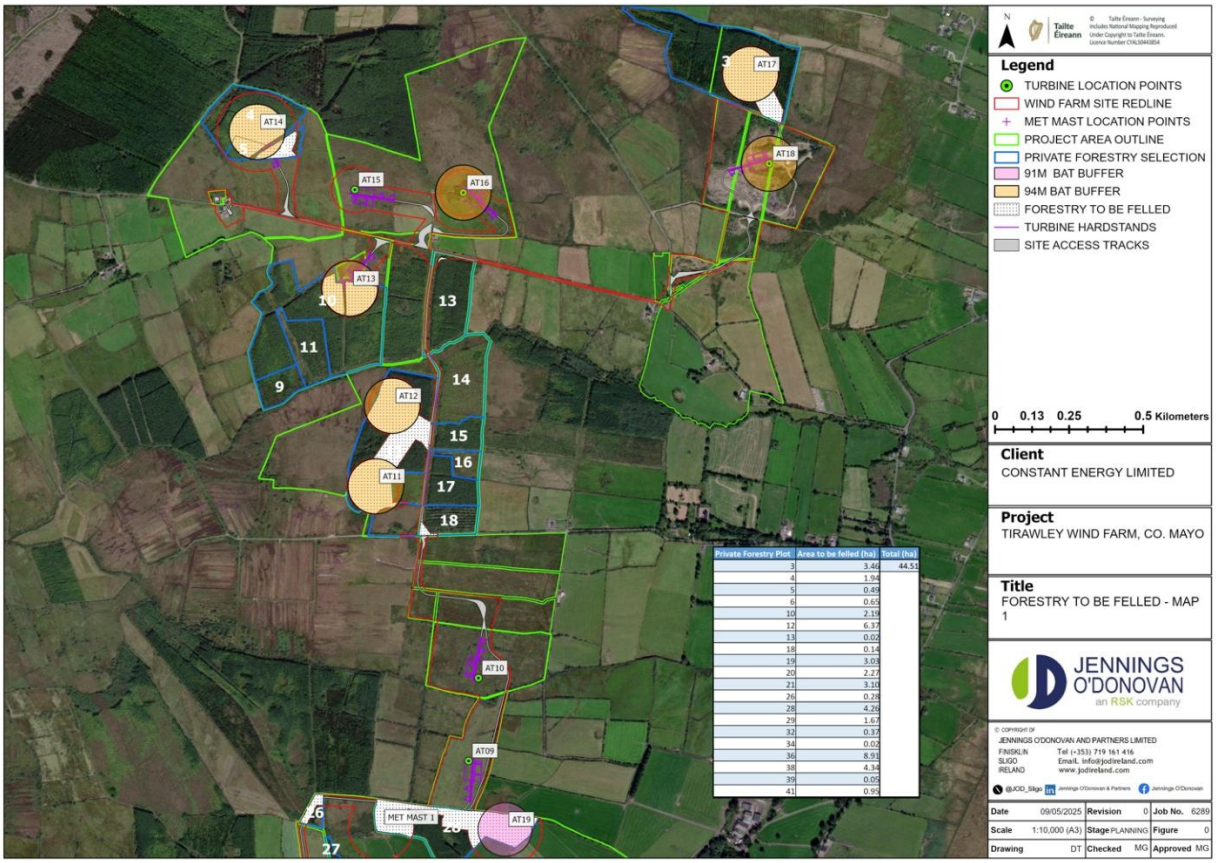

Figure 7: *Felling areas for proposed wind farm infrastructure (1 of 3).*

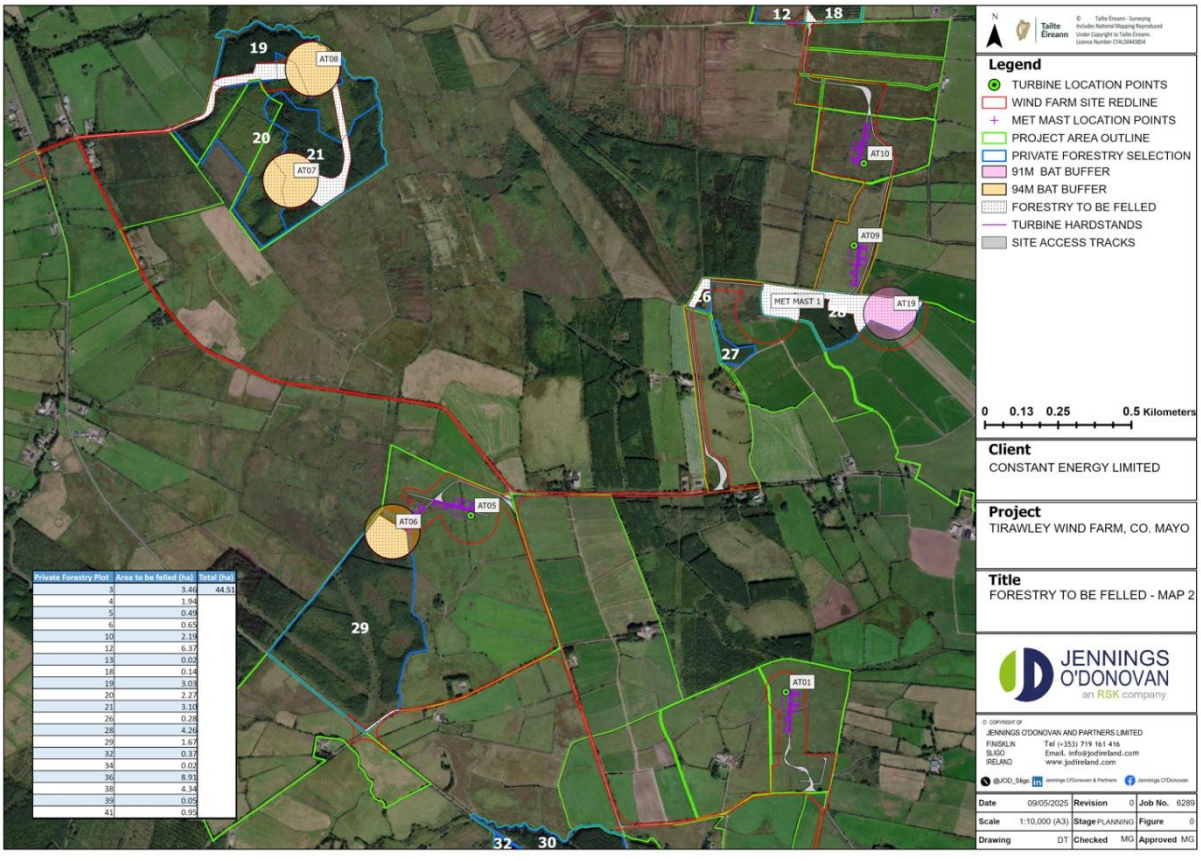

Figure 8: *Felling areas for proposed wind farm infrastructure (2 of 3).*

Figure 9: *Felling areas for proposed wind farm infrastructure (3 of 3).*

Potential impact of AT03, AT13, AT14 & Met Mast 2 (including access roading)

As detailed in previous sections, the proposed windfarm access is creating new paths through the forest, creating new forest edges not previously exposed to wind. However, the forestry surrounding the proposed locations of AT03, AT13 and AT14 and Met Mast 2 is small due to later planting years, and variable tree growth due to the poor underlying soil. Any clearance or removal of trees of this size is far less intrusive or potentially damaging to the surrounding forestry. Removing areas to facilitate the turbines and roading infrastructure should not increase the risk of extensive windblow as the trees are small and should have time to stabilise before a risk of windblow materialises.

This area is located on wet peat soils, and as the trees are of such a low yield class and quality, from a cost-benefit analysis point of view, the cost to extract the trees post harvesting would not seem advantageous. By not extracting the timber to the roadside at the proposed locations for Met Mast 2 and AT03, AT13 and AT14, the harvesting machine will have more brash to use to create brash mats under the machine while harvesting, also eliminating the need for forwarding machinery to enter the site to extract timber. This will reduce the risk of soil erosion and impaction.

Potential impact of AT04 (including access roading)

The trees growing in plot 38 where turbine AT04 and access roading are proposed are of a young age, and as such removing areas to facilitate the infrastructure required should not increase the risk of extensive windblow as the trees will be small and should have time to stabilise before the risk of wind damage materialises.

Potential impact of AT02, AT04, AT06, AT07, AT08, AT11, AT12, AT17, AT19 & Met Mast 1 (including access roading)

Where trees have been planted in earlier years and have had reasonable growth rates (e.g. plots 3, 12, 19, 21, and 32), where the turbines AT17, AT12, AT08, AT07, AT04 (plot 32), AT06, AT02, AT19, AT11 and Met Mast 1 are proposed, clearfell harvesting operations will be scheduled post the estimated timescale of any wind farm development being built, meaning there will be larger trees in these areas that will need to be harvested to allow infrastructure (access roads, hardstands, bat buffer areas etc.) to be constructed.

The opening of new edges into these areas may encourage the development of windblow due to the size of the trees that will be present. In the majority of these plots, the proposed turbine locations are in the centre of the plot, which will result in new edges and wind tunnels throughout the forest. Early clear-felling to a wind-firm edge may be necessary to prevent windblow encroaching into the forests - this is dealt with in the mitigation section following.

Other considerations

Beyond the risk to the remaining forestry, there are a number of other potential impacts to consider:

Soil and water quality: issues relating to potential soil damage and water pollution from construction activities are dealt with in the Biodiversity, Soils and Water Chapters of the EIAR. The risk of soil damage and harvesting residues entering waterways during a wind farm development is no different to the risk arising from the regular harvesting of these crops.

Wildlife habitats: the effects on loss or change of habitats are considered in the biodiversity chapter of the EIAR.

Archaeology: harvesting operations involving the movement of heavy machinery hold the potential to cause structural damage to archaeological sites if not properly planned. However, this risk applies to the normal harvesting of the existing forestry and is not especial to the planned felling for the proposed wind farm.

Road traffic and noise disturbance: the felling of merchantable trees will require timber lorries to transport logs from the site - any increase from existing felling plans is likely to be minimal and the impacts a temporary inconvenience. Additionally, harvesting and timber haulage will occur during daylight hours, and resulting noise would resemble that of agricultural machinery in the local environs.

Carbon sequestration: the permanent removal of trees for wind farm construction will reduce the carbon sequestration capacity of the existing forestry. However, an equivalent area of alternative land(s) will be planted on a compensatory basis for all infrastructure felling areas, where newly planted trees will absorb carbon as they grow. Additionally, trees that will be felled as part of this development will be converted to timber products where carbon will be stored long-term.

Mitigation

Concerning the proposed development, maximum use of existing forestry infrastructure has been considered during the planning of the project, thereby minimising the areas of existing forestry to be removed for the construction of access roads etc. Existing forestry within the development area was planted originally as part of a silvicultural rotation that is due to be harvested in the future as a commercial crop, irrespective of whether a wind farm is being constructed or not. By the time the proposed development has reached the construction phase, some areas of mature forestry may have reached the end of rotation naturally and may already be felled or due for felling - replanting can then be planned around the proposed development.

In some areas of the development, the trees are of such a low yield class and quality, from a cost-benefit analysis point of view the cost to extract the trees post-harvesting would not seem advantageous. This will allow the harvesting machine to use more brash as padding under the machine when moving across the site, while also eliminating the need for forwarding machinery to enter the site to extract timber.

If economical, the felling and extraction of timber will, as far as possible, be undertaken at the same time as currently licensed extraction activities in order to minimise traffic and noise disturbance.

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 as the support of neighbouring stems has been lost. While the timescale of this felling to be brought forward is not considered significant, various measures should be taken to minimise any potential adverse impacts.

Harvesting operations

An overview of standard mitigation measures for tree harvesting works is provided below, based on existing standards and guidelines (DAFM, 2019; DAFM, 2024b) - additional measures may be required as per felling licence conditions.

General considerations

- Proposed works to be conducted in strict accordance with all relevant standards and guidelines developed by the Forest Service (DAFM), including:
    - Forest Biodiversity Guidelines (Forest Service, 2000)
    - Forest Harvesting and the Environment Guidelines (Forest Service, 2000b)
    - Forestry and Water Quality Guidelines, (Forest Service, 2000c)
    - Forestry and Archaeology Guidelines (Forest Service, 2000d)
    - Forestry and the Landscape Guidelines (Forest Service, 2000e)
    - Forest Protection Guidelines (Forest Service, 2002)
    - Felling and Reforestation Policy (DAFM, 2017)
    - Standards for Felling & Reforestation (DAFM, 2019)
    - Environmental Requirements for Afforestation (DAFM, 2024)
    - Forestry Standards Manual (DAFM, 2024b).

- Contingency plans to be designed according to Section 5 of the *Standards for Felling & Reforestation* (DAFM, 2019) and to be triggered if necessary.

- A safety statement to be issued to ensure that any dangerous or sensitive areas are well known to all relevant individuals.

- A harvest plan to be designed for all associated harvesting operations. This will outline access points, environmental/service features and exclusion zones, fuelling and maintenance areas, log stacking areas, timber extraction routes, drain crossing points (if required), silt trap locations, and to 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.

- The responsible forester(s) to walk the site with contractors to highlight any prominent site risks or any sensitive habitats that are present.

- The CEMP should be consulted by all site operators before any work is completed.

- Harvesting works to only be conducted by experienced and competent contractors - all relevant P.P.E. must be worn while working on the site.

- On-site supervision to be present to ensure all harvesting operations are carried out according to standards, and to confirm mitigation measures are effective.

- Harvesting machinery to be fitted with up-to-date spill kits to mitigate against an accidental fuel spillage.

- Felling and extraction to cease during and after periods of rainfall that could result in the surface mobilisation of silt until conditions improve.

- Trees to be directionally felled away from sensitive features.

- Where fallen trees with exposed root plates are being cut during tree felling, the exposed root plates can be manoeuvred back into their original positions, where appropriate and safe to do so, in order to eliminate possible sources of silt.

- It will typically be a condition of a felling licence to treat all conifer stumps with urea immediately upon tree felling where the soil type is mineral soil or where a peat soil is less than 25cm (excluding the litter layer) in depth. Treatment is not required where a conifer stand is being replanted with broadleaves, where conifers within a broadleaf stand are being removed or where broadleaf species constitute more than 85% of a stand.

- Any drains crossed during the extraction phase to 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.

- Any waste or hazardous materials that accumulate throughout operations to be carefully removed from the site when works are complete.

- Forest infrastructure to be inspected for any signs of damage and to be repaired if necessary.

Water protection

- When planning harvesting activities, minimize the crossing of drains, relevant watercourses and aquatic zones during felling and extraction. Stacking areas to be located at least 50 metres from aquatic zones.

- A 10-metre machinery exclusion zone to be created from the edges of any aquatic zone, water hotspot or water abstraction point that overlaps with the harvesting area.

- A 5-metre exclusion zone to be established from the edges of any relevant watercourses present.

- Prior to harvesting works, silt traps to be installed within existing forest drains that connect with aquatic zones, either directly or indirectly through other relevant watercourses. Silt traps to be constructed along the length of drains and to be monitored and maintained as required throughout works.

- 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.

Figure 10: *Silt trap for sediment control in a commercial forest.*

- The storage, maintenance and refuelling area to be located in dry and sheltered location, at least 50 metres from aquatic zones and 20 metres from relevant watercourses. No rinsing of fuel, chemical or oil containers to occur on site.

- Harvesting machinery must not enter any exclusion zones: trees standing within an exclusion zone that are outside the reach of the harvester arm to be manually felled by an experienced chainsaw operator and removed by an extended harvester arm for processing and stacking outside of the exclusion zone.

- Temporary bridging points to be used where machinery routes cross an existing water feature - direct crossing over a stream bed is not permitted. Water features to be crossed at a right angle to the flow of water and any necessary crossing to be via an appropriate structure - see *Standards for Felling & Reforestation* (DAFM, 2019).

- Temporary bridging points to be monitored for the duration of the felling works and to be maintained as required.

- When harvesting works conclude, temporary bridging points to be removed and the relevant areas restored to their original condition, with due care afforded to avoid the release of any lodged harvesting residues.

- Regular visual monitoring of relevant watercourses and aquatic zones to occur to check for any silt/sediment discharge from site works.

Soil protection

- Dense brash mats to be laid along all machinery routes to preserve soil quality.
- Additional brash to be deployed to reinforce any sections of soft ground which are subject to high levels of machinery passage.
- Brash mats to be replenished as soon as they exhibit signs of wear and brash to be kept out of exclusion zones.
- Timber extraction routes to be directed away from water features wherever possible.
- Once harvesting works begin, harvesting operators to follow general extraction routes and stacking areas as marked on a Harvest Map.
- While harvesting is ongoing, every effort to be made to avoid any damage to the site. Operators to regularly monitor machinery routes for signs of soil damage and use extra brash (where available) to pre-empt the risk of soil rutting on the site.

Figure 11: *Brash mat on a harvesting rack.*

- Should ground conditions begin to visibly deteriorate, a new track to be promptly established containing a new brash mat layer.
- Load sizes on forwarders to be monitored during the timber extraction phase to ensure no overloading occurs.

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:

- An appropriate exclusion zone to be established for any wildlife habitats present within the harvesting areas, and the location of such exclusion zones to be marked on harvest map and to be well known by all operators on site before any works commence.
- Old and windfirm broadleaf trees to be retained wherever possible, especially where these contain deeply fissured bark, cavities, ivy cover, woodpecker holes etc.
- Deadwood to be left in situ following harvesting operations- this may comprise standing dead trees, logs deliberately left behind on the forest floor or naturally fallen branches.

Archaeology

All guidelines concerning forestry and archaeology must be strictly adhered to:

- An appropriate exclusion zone to be established from the outer edges of any archaeological features - see *Environmental Requirements for Afforestation* (DAFM, 2024).

- In the event that an unrecorded archaeological feature is found during harvesting works, it shall be immediately reported to the National Museum of Ireland or the Garda Síochána. A minimum 20-metre exclusion zone to be established around the feature until the site of the find has been investigated (Forest Service, 2000d).

Service features

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

- Works scheduled to occur near overhead power lines to be conducted according to Section 7 of the Forestry Standards Manual (DAFM, 2024b). Goalposts and safety signage to be erected where machinery / vehicles pass under an overhead powerline on or near the harvesting site.

Replanting Obligations

Forest Service policy outlines different tree removal scenarios (DAFM, 2017). Table 2 outlines the six main scenarios where permanent tree removal may be considered, and whether alternative afforestation and the repayment of grants and premiums is required where approved.

Table 2: *Scenarios where the permanent removal of forestry may be considered (DAFM, 2017).*

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

Note: Adapted from *Felling and Reforestation Policy* (DAFM, 2017), pp. 30. © Forest Service, Department of Agriculture, Food & the Marine.

The proposed felling to enable the construction of the Tirawley wind farm relates to 'Scenario 2' in Table 2 and would thus require the submission of a felling licence to the Department of Agriculture, Food and the Marine (DAFM). Table 3 illustrates the requirements for each category of tree felling associated with wind farm development.

Table 3: *Requirements for each felling category associated with wind farm development (DAFM, 2017).*

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% of turbulence fell area	No

Note 1: If 'YES', the alternative site must be of an area equivalent in size (see Section 5.7 of 'Felling and Reforestation Policy'). 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.

Note: Adapted from *Felling and Reforestation Policy* (DAFM, 2017), pp. 33. © Forest Service, Department of Agriculture, Food & the Marine.

As outlined in Table 3, all areas due for permanent felling will need to be replaced through compensatory afforestation of an equivalent area of alternative land. The afforestation of any alternative land would first require 'Technical Approval' from the Minister for Agriculture, Food & the Marine under the Forestry Act 2014, and its consent is regulated under the Forestry Regulations 2017 (S.I. No. 191 of 2017).

To facilitate the construction of the proposed wind farm at Tirawley, approximately 44.51 hectares of existing forestry is due for infrastructure felling (Table 4).

Table 4: *Total areas of forestry to be removed and replaced for the proposed project.*

Infrastructure	Forestry plot(s)	Infrastructure felling area (ha)	Alternative land required (ha)
AT01	-	0.00	0.00
AT02 (incl. access road)	10 + 36 + 39 + 41	2.91	2.91
AT03 (incl. access road)	36 + 38	5.15	5.15
AT04 (incl. access road)	32 + 34 + 38	4.21	4.21
AT05	-	0.00	0.00
AT06	29	1.58	1.58
AT07 (incl. access road)	20 + 21	4.35	4.35
AT08 (incl. access road)	19 + 20	4.03	4.03
AT09	-	0.00	0.00
AT10	-	0.00	0.00
AT11 (incl. access road)	12 + 18	3.44	3.44
AT12 (incl. access road)	12 + 13	2.93	2.93
AT13	10	1.79	1.79
AT14 (incl. access road)	4 + 5 + 6	3.08	3.08
AT15	-	0.00	0.00
AT16	-	0.00	0.00
AT17 (incl. access road)	3	3.46	3.46
AT18	-	0.00	0.00
AT19 (incl. access road)	28	3.18	3.18
Met Mast 1 (incl. access road)	26 + 28	1.37	1.37
Met Mast 2 (incl. access road)	36 + 41	2.78	2.78
Public road widening	18 + 29	0.25	0.25
Total:		**44.51**	**44.51**

The project developer is fully committed to the sourcing of appropriate alternative lands to ensure no net forestry loss occurs. Non-grant-aided afforestation licence(s) will be sought from the Department of Agriculture, Food, and the Marine for all alternative land sites.

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. The following will also apply concerning the afforestation of any alternative land:

- The proposed afforestation of any alternative land site must be evaluated and (if deemed suitable) receive written approval from the Department of Agriculture, Food and the Marine before an associated felling licence can be granted.
- An afforestation licence must be applied for online by a registered Forester via the DAFM iFORIS iNET system.
- The standard procedures regarding the evaluation of afforestation applications generally will apply, regarding referrals, protocols, AA screening, EIA determination, etc.
- It will be a condition on a felling licence (if issued) that 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, 2024b).

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 a felling licence that an equivalent area of land will be subject to compensatory afforestation in lieu of the total area of forestry due for infrastructure felling. Thus, the extent of the lands required for afforestation can also only be known once planning permission has been granted for the project. In these circumstances, the application for the licence can, in practical terms, only be made once planning permission has been granted.

In any event, it is prudent to progress the felling and afforestation licences closer to the time when the proposed felling activities are required, rather than far in advance during the wind farm planning submission stage - when the project programme remains uncertain and the exact areas cannot be fully confirmed. If a licence was obtained prior to seeking and/or obtaining planning permission, it is likely that any licencing approvals received from DAFM would have expired before they could be undertaken due to the time required for planning processes and post-planning delivery preparations. A DAFM approved afforestation licence expires 3 years from the date which they are consented.

Critically, given the dynamic nature of the receiving environment, the identification and licensing of alternative afforestation lands at a later point in time (post planning consent) has the added benefit of ensuring that the licensing process fully reflects current legislative requirements, and, more importantly, the most up-to-date environmental information, and that cumulative/in-combination assessment considers the wider environmental impacts at that point in time. In addition, the developer will not commence the project until written approval from DAFM has been received for the associated felling and afforestation licences. This will ensure that proposed alternative land has been identified, assessed and licenced appropriately by the relevant consenting authority.

The first step of this process involves sending a non-grant-aided afforestation licence application for any alternative land sites, and a felling licence application for the project construction to the Department of Agriculture, Food and the Marine.

Conclusion

The proposed wind farm development at Tirawley, Co. Mayo, will require the infrastructure felling of 44.51 ha of existing forestry. These trees will need to be removed to facilitate the construction of the various infrastructural components of the wind farm. With the proviso that the proposed mitigation measures are adopted, no significant residual impacts are expected.

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